ELECTRICAL WEST

APRIL
1936

McGRAW-HILL CO. OF CALIFORNIA

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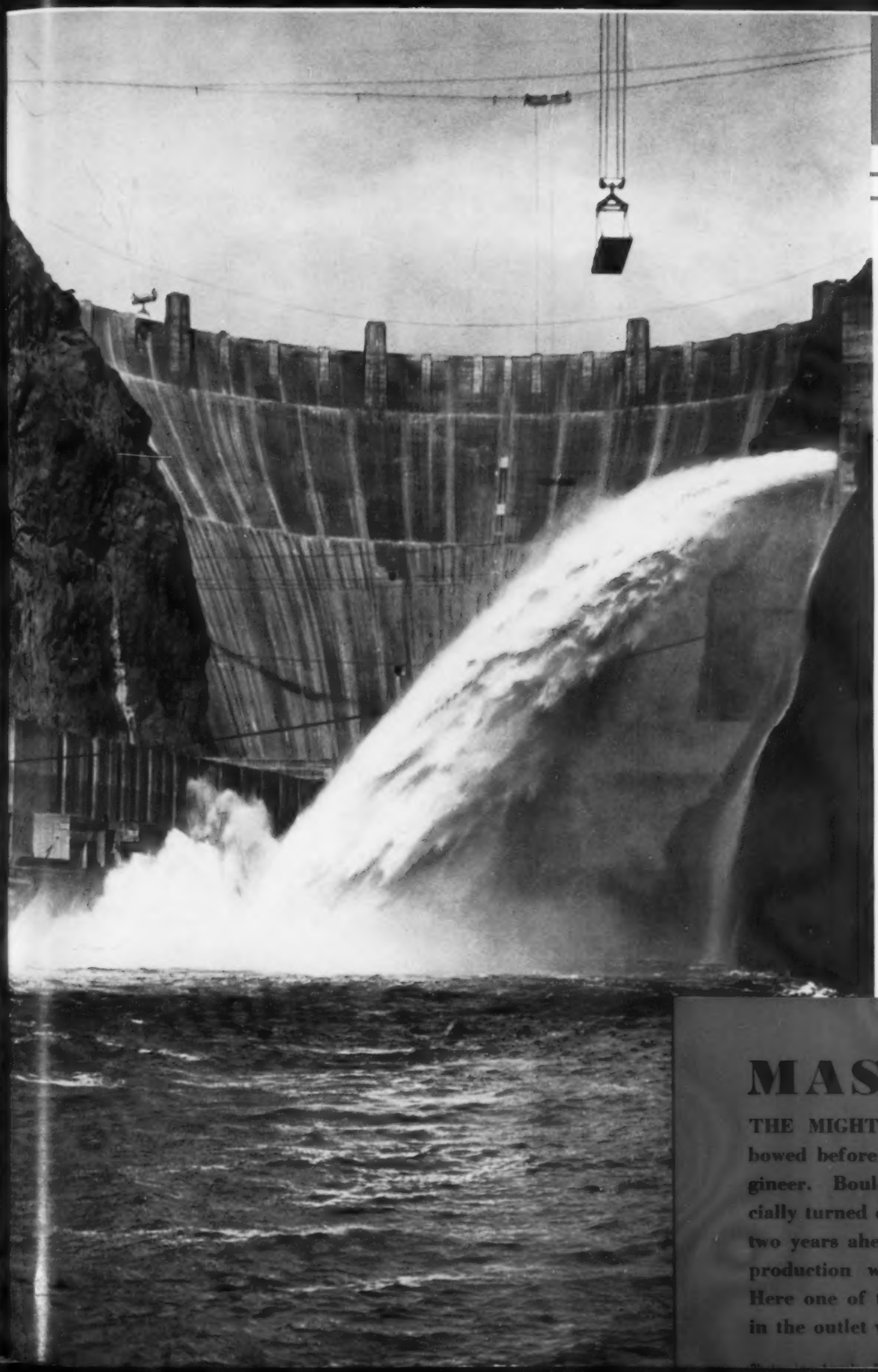
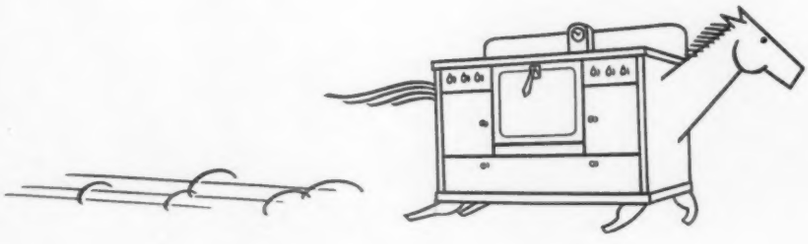


MASTERED

THE MIGHTY Colorado River has bowed before the mastery of the engineer. Boulder Dam has been officially turned over to the government, two years ahead of schedule. Power production will start this summer. Here one of the 84-in. needle valves in the outlet works is being tested.



PLAY THE FIELD FOR A SURE THING

The percentage is all in your favor! Here's how it lines up. There are more than 500,000 families in Edison territory. Of these, only thirty thousand own electric ranges.

Figure it out! That means electrical dealers have four hundred and seventy thousand prospects for electric ranges alone. And more than that for electric water heaters.

The fact that there is at least one automobile for every one of these families proves conclusively that they have the buying power.

Edison advertising, and low domestic wholesale rates, should go a long way to make the going easy. Play the field—and win!

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

4-36

Edison

CALIFORNIA'S *Electrical Age* HAS JUST BEGUN!

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), April, 1936, Vol. 76, No. 4. Published monthly by the McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shilling). Single copy, 25c.
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ELECTRICAL WEST

With which are consolidated the "Electrical Journal," the "Journal of Electricity, Power and Gas," and the "Journal of Electricity."

ESTABLISHED 1887

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▼

• AIR CONDITIONING speaks out. After somewhat hesitant marketing gestures during the period that air-conditioning equipment was undergoing its incubation, the industry is now prepared for a mass assault on a scarcely-touched market. Experts foresee a great future for their own, and associated electrical industries. In the symposium beginning on Pg. 39 are set forth air conditioning's plans for 1936, including marketing methods, sales promotion, load building plans and new equipment.

•

• UNPRECEDENTED low cost was recorded for a new underground installation recently completed by the Pacific Gas & Electric Co. In Idaho, a small newly-constructed hydro-electric station operates with new flood-proof and remote-control features. Both these developments are covered in the Engineering Symposium.

•

• RURAL LOAD BUILDING presents experimental data on the correct application of soil-heating cables. The economies, load building potentialities and performances of soil-heating cables will be found in this feature.

•

• NORTHWEST ELECTRIC LIGHT & POWER ASSN., Comercial Section, submits an important report on load building, commercial activities and sales plans. The report appears on pages 29 to 31.

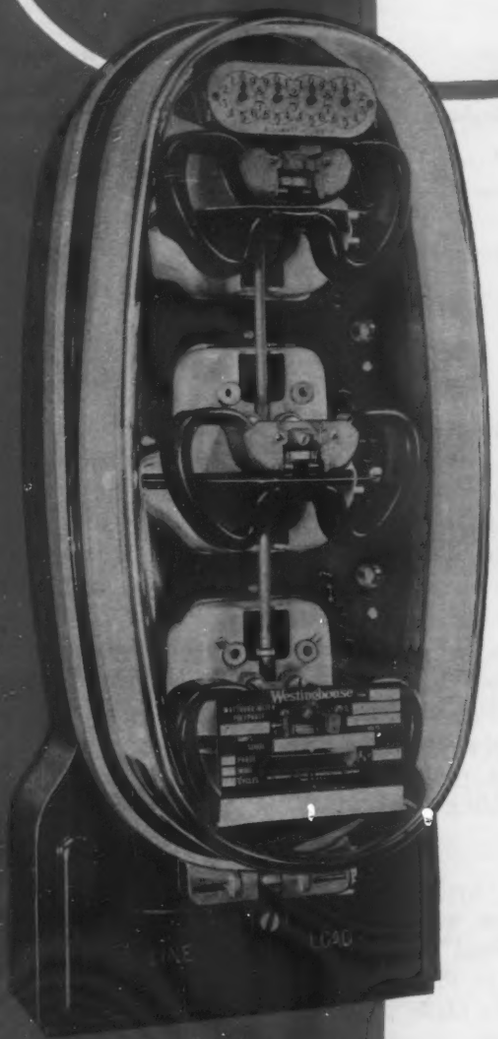
•

COMING

• CONVENTION-IN-PRINT. In the June issue of ELECTRICAL WEST will appear the Fourth Annual Convention-in-Print. Hailed by the leaders of the industry as most effectively filling the gap left by the abandonment of the annual convention, Convention-in-Print will for the fourth time link together and present the year's progress of the electrical industry in the West. Aimed to recreate the friendly, stimulating atmosphere of the actual convention, it will again include valuable presentations of Executive thought, and opinion, a forum of all-industry problems, and operating and economic symposiums.

OUTSTANDING

because:



(1) It has the same excellent performance characteristics as the Type CS Detachable Meter (2) Only three ratings (5, 15, and 50 amperes) required for all self-contained loads up to 150 amperes (3) Only one size of base and terminals, regardless of rating (4) Micrometer adjustments (5) Potential lamps are standard equipment (6) Electromagnets are interchangeable (7) Die-cast, aluminum-alloy base with dust-proofed back fully encloses and protects electromagnets and all wiring (8) Improved insulation and one-piece moulded terminal block (9) Simplicity in design of every part assures lifetime accuracy.

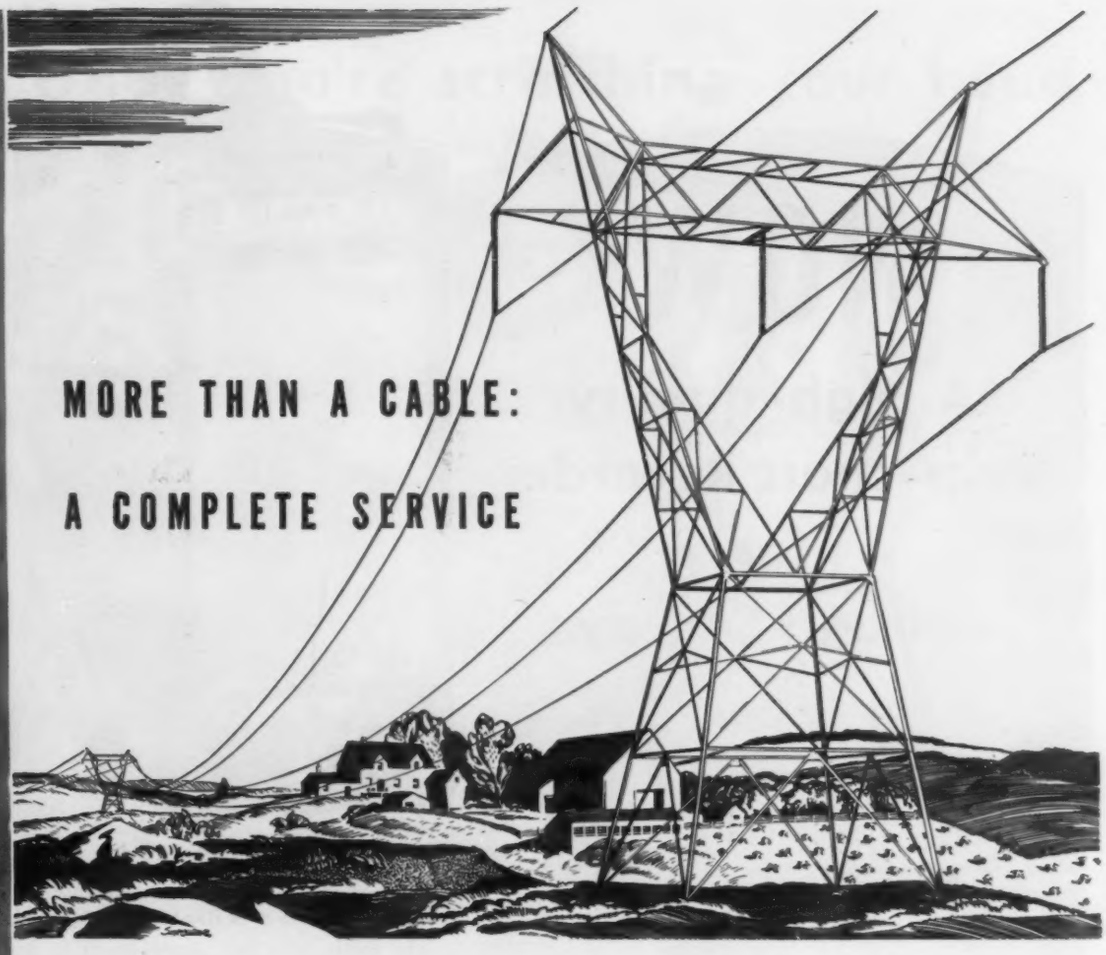
J 40005

•Types C-2 to C-9, two and three-element designs are available for all front-connected polyphase applications. For more detailed information, just ask for a copy of Catalog 42-135.

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Westinghouse

A·C·S·R·



MORE THAN A CABLE:

A COMPLETE SERVICE

Behind the dependable performance, for which A.C.S.R. is noted, lies an engineering service which is part and parcel of all that A.C.S.R. stands for in the minds of transmission engineers.

A.C.S.R. counsel is counted upon to help attain the greatest initial economies. Our engineers are equally concerned in assuring long-time dependability.

It is important to all engineers that the only really exhaustive investigation into the causes of conductor vibration was sponsored by A.C.S.R. It is still more important to know that the technique of vibration control, and the simple accessories by which it is achieved, was developed as a part of A.C.S.R. service to the industry as a whole.

Now, to the proved dependability of A.C.S.R. is added the protection afforded by the use of Armor Rods and the Stockbridge Damper.

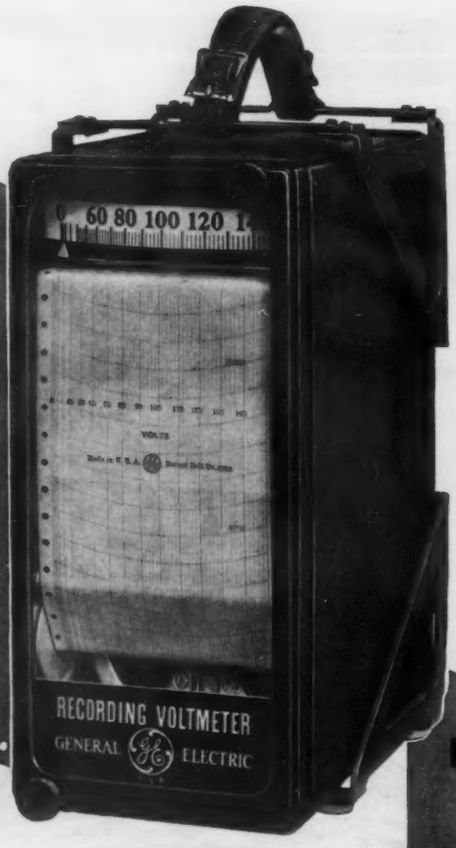
If you have not all the facts on the fundamental protection provided by these accessories, address ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA

ALCOA · ALUMINUM

NOW

A High-quality Strip-chart Recorder for Voltage Surveys



PRICED AT $80

HERE'S good news! General Electric now offers accuracy—performance—and quality—in a portable recording voltmeter, priced at $80 or $85.

Inexpensive Voltage Surveys

Maximum accuracy at minimum cost. That's what this recorder (Type CD-23 or CD-24) will give you. It is just right for voltage-survey work and offers an economical means to reduce power costs and equipment investment.

Its usefulness, however, may be extended to all fields that require accurate graphic records of circuit conditions.

High Electrical Accuracy

The electric element is designed to measure voltage values accurately and quickly. It is identically the same as the one in the more expensive CD-13 and CD-14 recorders. One per cent of full-scale accuracy can easily be maintained.

Reliable Chart and Recording Mechanism

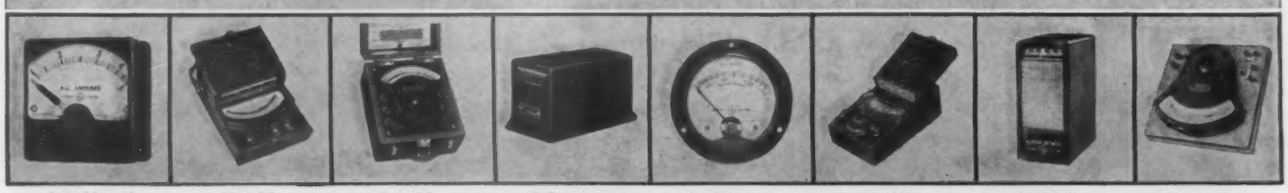
The mechanism is dependable. It is built to give years of trouble-free service without any loss in accuracy. A Warren Telechron motor drives the timing device in the CD-23 ($80); a spring clock is used in the CD-24 ($85). Both are single-range (0-150 volts) and single-speed "3 inches per hour" instruments.

Simplified

These instruments are basically the same as the well-known CD-13 and CD-14 recorders. However, certain features such as hinged window, double rating, and double chart speeds have been omitted. You get an instrument with sufficient adaptability for voltage-survey work, at large savings.

Be sure and write to your nearest G-E sales office for Bulletin GEA-2294, or to the General Electric Company, Dept. 6B-201, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRIC INSTRUMENTS



Switchboard | Portable | Portable | Galvanometer | Small panel | Portable | Recording | Laboratory

430-59

GENERAL ELECTRIC

When you're scratching your head over . . . .

JUST remember that it has been our pleasure . . . to assist many electrical manufacturers in planning the most intelligent use of silicon steel sheets. Naturally no one grade of sheet fits all applications. Therefore, we manufacture:—

American Transformer and Radio Sheets in several grades for transformers and certain types of high efficiency motors and generators.

American Dynamo and American Motor grades are well suited for generators, motors and some transformer designs.

American U. S. Electrical is standard for the general run of motors and is supplemented by:—

American Armature, a lower grade much used in fractional horse power equipment where inductions are higher than average.

Our Electrical Sheet Division is at your service to help you solve problems dealing with the use of Electrical Sheets. Our literature may help you. Send for it.

COLUMBIA STEEL COMPANY

Pacific Coast Distributors for American Steel & Wire Company

Offices and Warehouses:

San Francisco, Los Angeles, Portland, Salt Lake City, Seattle

UNITED STATES STEEL

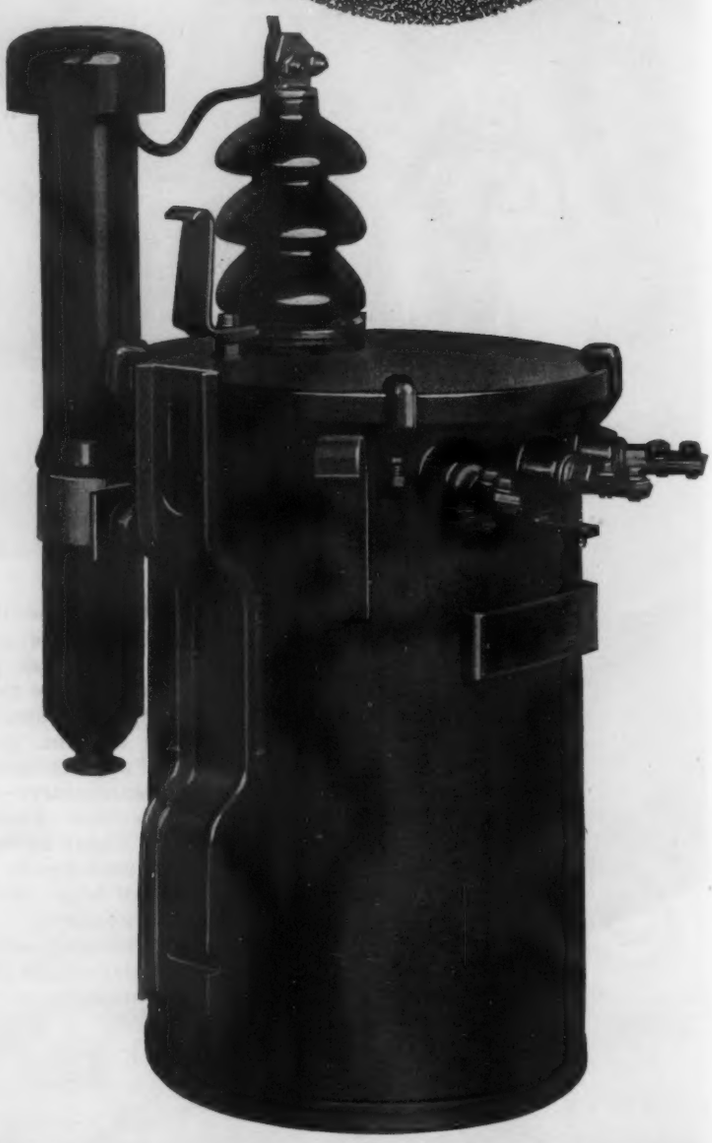
Now Available!

A NEW SURGE PROTECTED RURAL LINE TRANSFORMER

HIGH EFFICIENCY TYPE—ALL SIZES

IN addition to Reduced Efficiency Rural Line Transformers in sizes 1 kva to 3 kva, Allis-Chalmers offers a new transformer for rural line service designed for high all day efficiency with integrally mounted surge-diverter and protective gap, and available in all N. E. M. A. ratings — 1½ to 25 kva inclusive — and for all commercial voltages.

Use of this new type transformer permits the economies of grounded neutral rural line extensions to be obtained with larger sizes of transformers than heretofore . . . with conventional efficiencies . . . with or without a surge-diverter integrally mounted.



Ask the nearest Allis-Chalmers representative for additional information concerning this new transformer.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

DEPEND UPON G-E FUSE PROTECTION

Use G-E Fuses of proven reliability to protect equipment and property. There are four types available: G-E N.E.C. Renewable or Non-renewable Cartridge Fuses; G-E Textolite or Pyrex* Top Fuse Plugs. All these types are designed to give maximum protection.

*Reg. U.S. Pat. Office.

GENERAL ELECTRIC

WIRING DEVICES

APPLIANCE AND MERCHANDISE DEPT., GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

SMASHING THROUGH
TO GREATEST GAINS IN HISTORY!

ALREADY, 1936 CARLOAD ORDERS FOR FRIGIDAIRE ARE MORE THAN DOUBLE THOSE FOR ANY SIMILAR PERIOD!

● The sensational New Frigidaire with the Meter-Miser and the "Buy on Proof" program are breaking sales records for dealers everywhere. Never before has America given such a tremendous welcome to any refrigerator. Families by the thousands are buying on Proof! They're choosing the New Frigidaire with the Meter-Miser because it meets All Five Standards for Refrigerator Buying—with Proof. . . . 1. Proof of Lower Operating Cost. 2. Proof of Safer Food Protection. 3. Proof of Faster Freezing—More Ice. 4. Proof of More Usability. 5. Proof of Five-Year Protection Plan. . . . Dealers are amazed at the power of this unbeatable combination—an outstanding new product and the most forceful, workable sales and advertising program they've ever known. It's a combination that is gathering irresistible momentum with each passing day. . . . The Big Push is on! And Frigidaire selling men are definitely on their way to the most sensational success in the history of the business.

FRIGIDAIRE
MADE ONLY BY GENERAL MOTORS

FRIGIDAIRE CORPORATION • DAYTON, OHIO

Be Sure TO SEE THIS BOOK

EVERY electric man should read the dynamic story of the electric range and water heater business as told in Hotpoint's new book of Sales Opportunities — "Now is the Time" — just off the press.

Every person in the industry, who is now old enough to shave, will see instantly that this new book dramatizes facts which point the way to surging new opportunities for those alert enough to take the tide of public opinion at its flood.

Ask the Hotpoint representative in your district to show you this important new book — or write today for your copy. Note especially these vital facts which exist today:

Low Priced Ranges — headed by the DORIAN remove the price barrier and put electric ranges on a competitive price basis with fuel type ranges.

Sweeping Public Acceptance — Read how surveys show that 30% of housewives *know* they want electric ranges — see how editors of women's magazines and newspapers throughout the country reflect the swing in public opinion to electric cookery.

New Home Building and Home Furnishing Business Active. This new Hotpoint book shows how home building and home furnishing sales are increasing by leaps and bounds and gives you the tools with which to capture range business.

National Advertising — See how Hotpoint saw the "straws" in the wind, learned that *now is the time* for a big range and water heater campaign — and began advertising with color pages in the Saturday Evening Post, Ladies' Home Journal, McCall's and full pages in Good Housekeeping and Better Homes and Gardens.

Hotpoint has timed its Big Campaign to the psychological moment. Don't delay. If you have not seen this book — get in touch with your Hotpoint representative at once.

EDISON GENERAL ELECTRIC APPLIANCE CO., INC.
5612 West Taylor Street, Chicago, Illinois

THE VITAL STORY OF CALROD

— Now the remarkable story of Calrod, Hotpoint's Hi-Speed heating coil, is told to the public with color pages in the Saturday Evening Post. This is making the public realize that Calrod means to Cookery what Mazda means to Light.

Right — Hotpoint's New DORIAN *Range — a large 39" range with full size oven at a remarkably low price.*

Hotpoint is ready for the big swing to Electric Water Heating with the most complete line of Water Heaters in the industry. Learn about Hotpoint's five exclusive features which place this new and complete line far in the lead.

ELECTRIC **Hotpoint** RANGES

WATER HEATERS

Our COMPLETE supply service

is BUILT AROUND your NEEDS

The completeness and usefulness of Graybar's service of supply results naturally from Graybar's years of experience in meeting utility needs... Operating through conveniently located warehouses, Graybar brings you what you want, when and where you want it... also Graybar cooperates further by constantly promoting the sale of load building electrical products of every description.

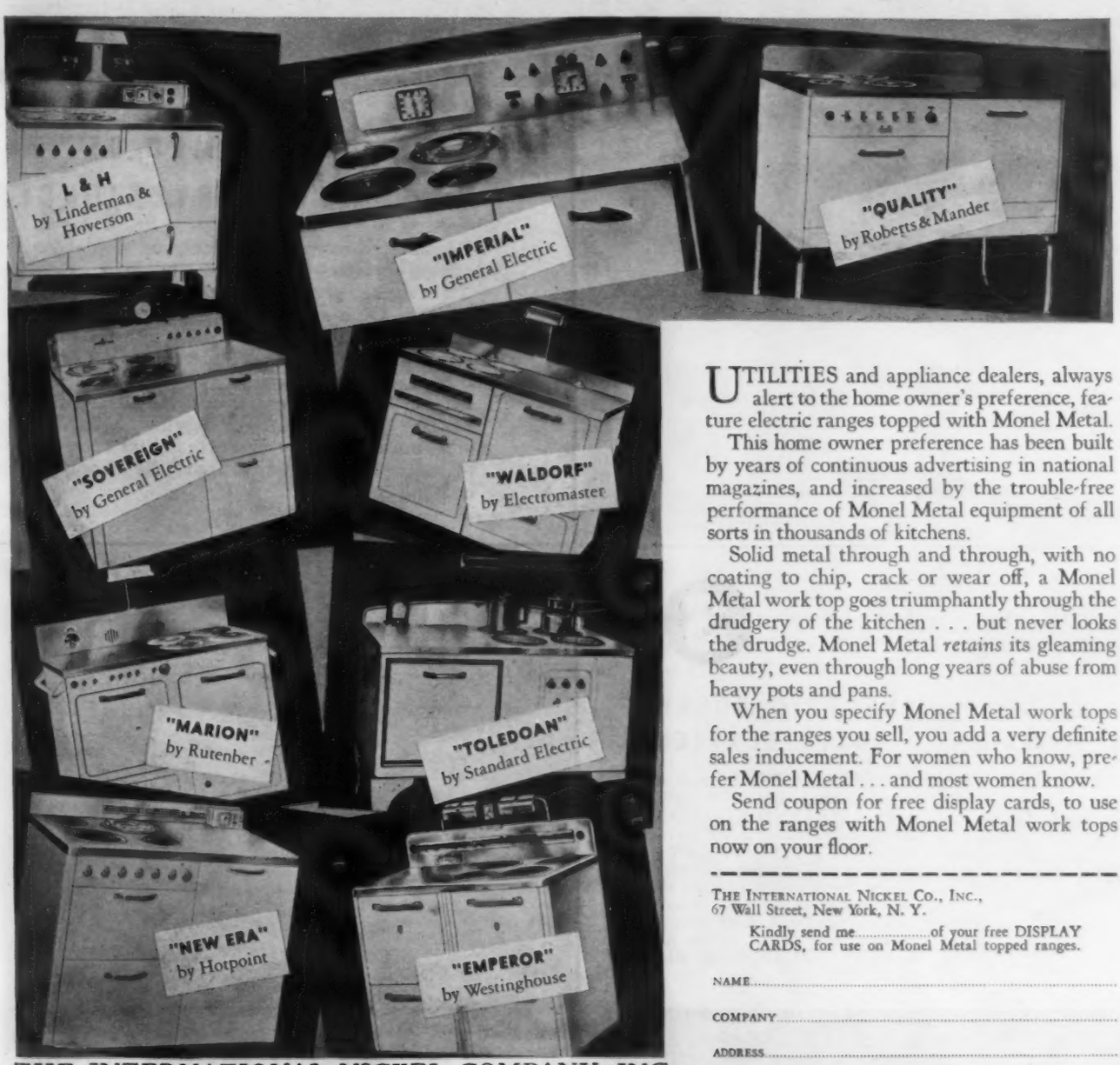
OFFICES IN 78 PRINCIPAL CITIES: EXECUTIVE OFFICES, GRAYBAR BUILDING, NEW YORK

Distributed and guaranteed by Graybar Electric Company

Graybar

MONEL METAL *is* "TOPS"...

with all of these Electric Ranges!



UTILITIES and appliance dealers, always alert to the home owner's preference, feature electric ranges topped with Monel Metal.

This home owner preference has been built by years of continuous advertising in national magazines, and increased by the trouble-free performance of Monel Metal equipment of all sorts in thousands of kitchens.

Solid metal through and through, with no coating to chip, crack or wear off, a Monel Metal work top goes triumphantly through the drudgery of the kitchen . . . but never looks the drudge. Monel Metal *retains* its gleaming beauty, even through long years of abuse from heavy pots and pans.

When you specify Monel Metal work tops for the ranges you sell, you add a very definite sales inducement. For women who know, prefer Monel Metal . . . and most women know.

Send coupon for free display cards, to use on the ranges with Monel Metal work tops now on your floor.

THE INTERNATIONAL NICKEL CO., INC.,
67 Wall Street, New York, N. Y.

Kindly send me.....of your free DISPLAY CARDS, for use on Monel Metal topped ranges.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

E. West 4-36

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

THE GOLDEN FLOOD OF SALES IS PROVING..

here's the Range America has waited for

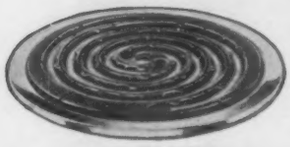
1

NEW STYLE AND BEAUTY WOMEN WANT

2 **UNDREAMED OF NEW CONVENIENCES**

Illuminated ovens with scientific "Heat-Eveners" . . . sliding shelves with flat non-tip bars . . . record speed. Twin ovens, giving more capacity with greater economy . . . Dual-automatic controls that sear a roast beautifully at high heat, then complete the cooking automatically at the lowest, most economical temperature, while you are away . . . Automatic "Minute Minder" . . . Illuminated cooking platform . . . Roller bearing drawers . . . Time-defying COROX sealed-in-steel-units . . . novel cigarette lighter . . . new "Economizer" platform units that cut monthly electric cooking costs.

"COROX" ECONOMIZER



EBONITE ECONOMIZER

3

ELECTRIC COOKING COSTS SLASHED

A triumph of Westinghouse engineering, combining TOP SPEED with AMAZING ECONOMY. Keeps food cooking as fast as it can cook, with but 40% as much electricity as the "low" on other electric ranges. For instance; a Savory Roast and Vegetable Dinner, by actual test that you can demonstrate and prove, cooks as fast as the fastest, AT A SAVING OF 40% IN ELECTRICITY.

4

SENSATIONAL VALUES

PRICES FROM

$61.25 TO $288.00

Westinghouse

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Range Beauty
WITH UNDREAMED OF COOKING CONVENIENCE
Every home needs Westinghouse
America's Most Beautiful Ranges
with the Sensational new ECONOMIZER that cuts electric cooking costs 18% lower
EVERY HOUSE NEEDS Westinghouse
Introducing New Ranges that will
ELECTRIFY AMERICA
Westinghouse Golden Jubilee Models combine new Beauty with amazing Economy and Convenience!
Westinghouse
"It's a joy to work in a Kitchen like this"
NOW YOU CAN HAVE ONE...EASILY
Every house needs Westinghouse
WESTINGHOUSE ALL-ELECTRIC
KITCHEN GUIDE
A complete manual of practical information for executives and salesmen
Introducing New Ranges that will
ELECTRIFY AMERICA

TO HELP YOU MAKE 1936 *your* GOLDEN PROFIT YEAR...

sixteen pages of full-color magazine advertising are carrying the news of these amazing Golden Jubilee Electric Ranges and of Westinghouse ALL-ELECTRIC KITCHENS in the short period to April alone.

Inquiries from women are pouring in by the thousands. Retailers to whom these are forwarded are enthusiastic about the greatest sales successes they have ever enjoyed. GET INTO THIS FAST-MOVING PROGRAM RIGHT NOW. MAIL THE COUPON. See the 72-page range portfolio and the kitchen manual illustrated at the right, showing the greatest array of sales helps and plans ever presented to speed YOUR sales of electric ranges and complete electric kitchens.

ELECTRIC RANGES

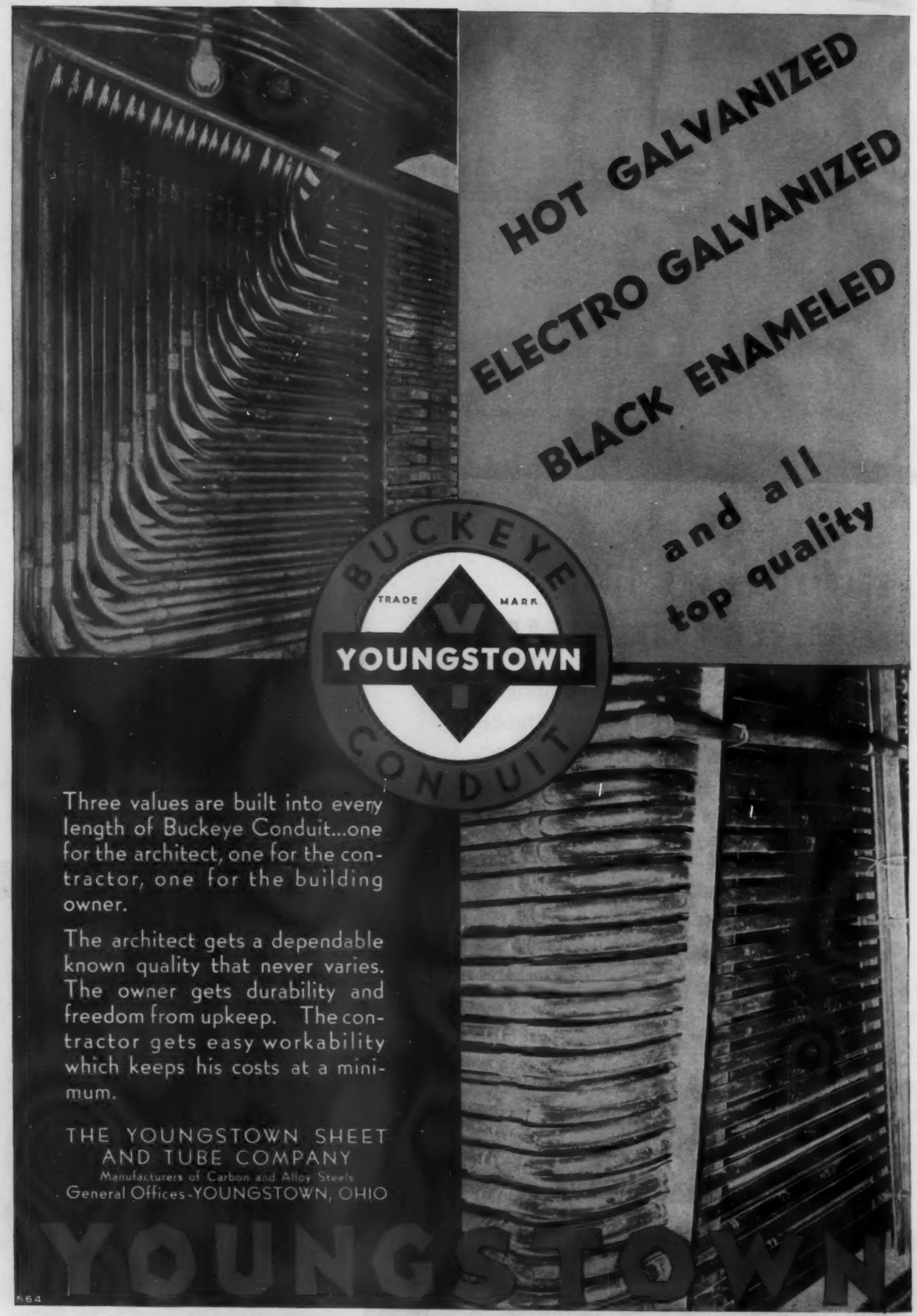
Westinghouse Electric & Mfg. Co., Mansfield, Ohio

I want the whole story of your Golden Jubilee electric range and complete electric kitchen program. RUSH it to me.

Company.....

Attention of..... (Title)

Address..... E.W.-4R


HOT GALVANIZED
ELECTRO GALVANIZED
BLACK ENAMELED
and all
top quality
BUCKEYE
TRADE
MARK
YOUNGSTOWN
CONDUIT
Three values are built into every length of Buckeye Conduit...one for the architect, one for the contractor, one for the building owner.
The architect gets a dependable known quality that never varies. The owner gets durability and freedom from upkeep. The contractor gets easy workability which keeps his costs at a minimum.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices-YOUNGSTOWN, OHIO
YOUNGSTOWN
564

PRINT IN BINDING

METER DEVELOPMENTS PROGRESS

in Modern "A" and "S" Mountings

Sangamo modern meter developments, whether singlephase watthour meters—combination singlephase watthour meters and time-switches, with either single or two-rate registers—or two-element watthour meters — all are designed for modern "A" or "S" mountings.

Many metering requirements are met by this line of modern meters. Standardization of design simplifies installation problems and minimizes cost and space requirements. . . . . .

Top — Types HFA and HFS singlephase watthour meters.

Center — Types HV-11-A and HV-11-S combination watthour meters and time-switches. Can be supplied with single or two-rate registers.

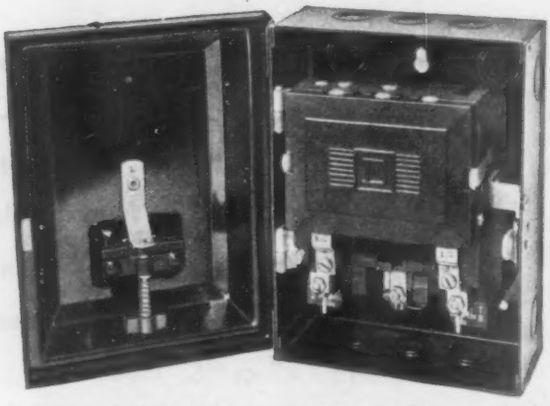
Bottom — Types L-2-A and L-2-S two-element, single disk, watthour meters.

SANGAMO ELECTRIC COMPANY

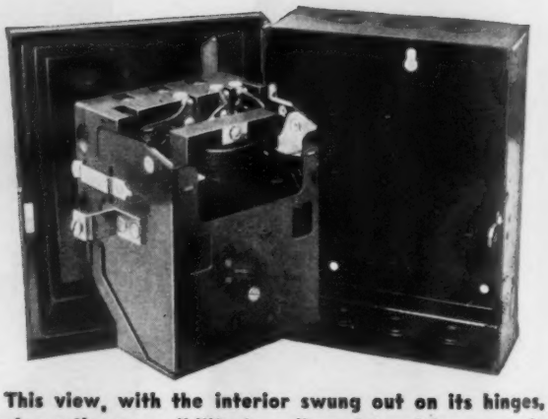
INSPECTED ✓ APPROVED ✓ ACCEPTED ✓

. . . The verdict is unanimous on this new SQUARE D achievement . . the class 8536 Type H32 starter . . available for the first time

You, too, are invited to inspect this new A.C. automatic starter recently developed by Square D. Your approval and acceptance of this starter should be as immediate, enthusiastic and as complete as many others who are interested in its application to their motor control problems. Maximum capacity—5 HP, 220 volts or 7½ HP, 440-550 volts, 2 or 3 phase.

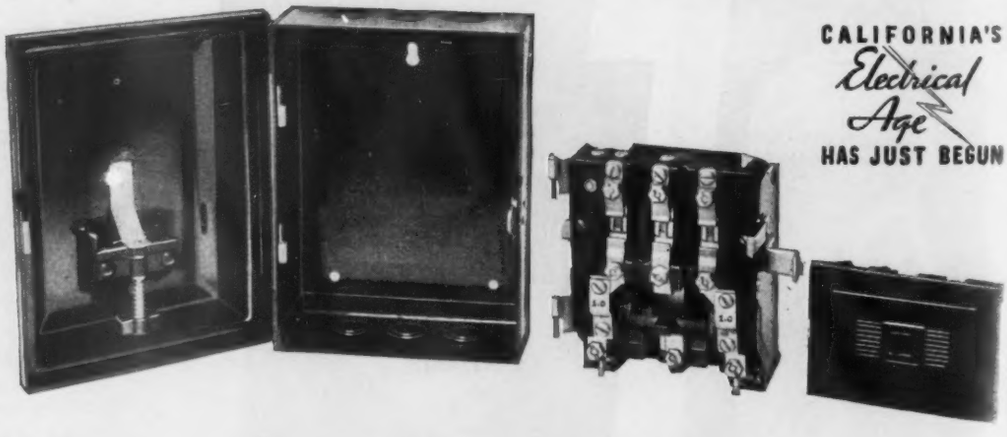


Note particularly the compactness, neatness of the interior design. Note also the ample wiring space,—the molded arc resistant contact base and shield,—the absence of wires between the interior and the cover.



This view, with the interior swung out on its hinges, shows the accessibility to coils and to wiring space in back of cabinet, as well as location of knockouts on sides and back of enclosure.

Interior, which is easily lifted off hinges, has been removed from enclosure, ready for inspection, change or replacement of parts. At extreme right is arc resistant shield. The comparative ease of getting at each component part of this starter will be invaluable from the standpoint of time and maintenance.



CALIFORNIA'S *Electrical Age* HAS JUST BEGUN

CALL IN A SQUARE D MAN

SQUARE D COMPANY
LOS ANGELES CALIFORNIA
DETROIT, MICHIGAN • MILWAUKEE, WISCONSIN
SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO.

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Your
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-5 HP,
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GUN

ELECTRICAL WEST

[*Devoted to the economic production, transmission and distribution of electric power and its application to industry, commerce and the home in the Pacific Empire, and to the sale and distribution of electrical utilization devices, equipment and appliances in that area*]

April 1936

SERVICE—The Electrical Yardstick

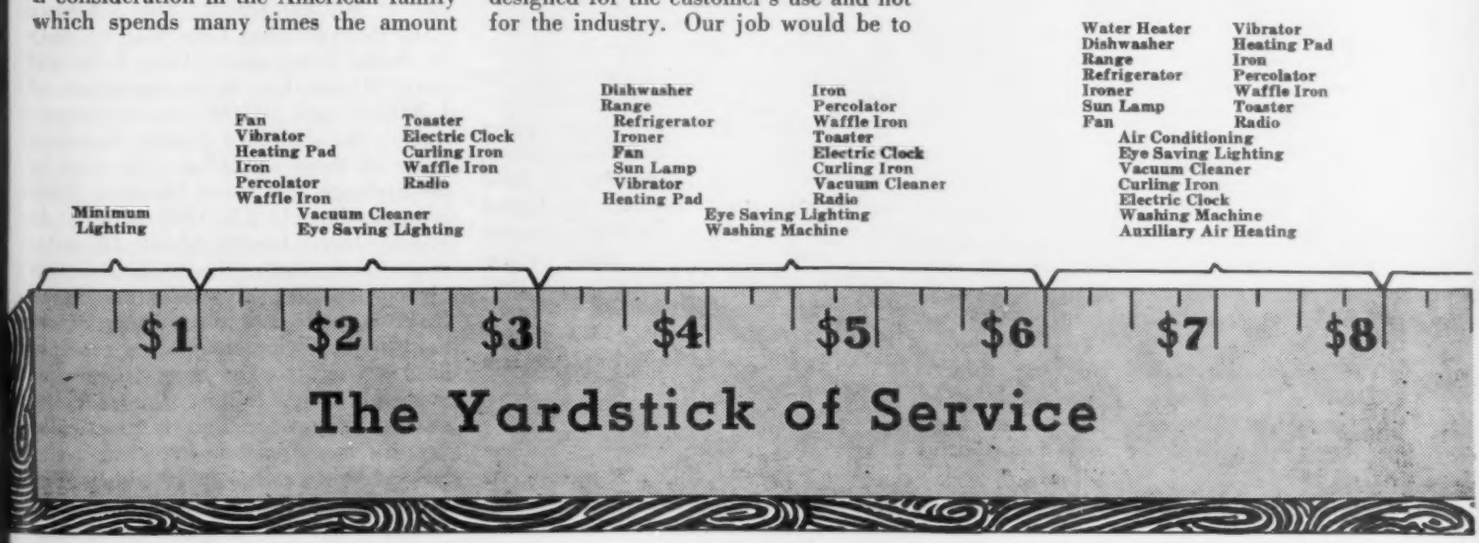
By VICTOR W. HARTLEY
Managing Director
Pacific Coast Electrical Association, Inc.

ALL THIS talk about "yardsticks" in connection with electrical usage conveys the impression that electricity is a commodity that can be sold by lineal measurement like dress-goods or tires. Nothing is further from the truth. Electricity is an intangible force which awaits conversion to a useful purpose before it has any value whatsoever. Electricity's value lies in its adaptability to perform a multitude of services that make daily routine less of a drudgery and add to pleasure and happiness of mankind. Who can measure the worth of electricity's convenience to each individual? Are dollars and cents representative of the worth of radio's world wide contacts to the bed-ridden invalid? Would anyone sacrifice the eye-saving comfort of modern lighting for kerosene lamps even if kerosene for illumination were cheaper than electricity?

Emphatically, the measurement of the value of electricity is the services it renders. Cost of electricity cannot be a consideration in the American family which spends many times the amount of the electric bill for gasoline, tobacco, cosmetics, sporting events, theatres and other mild forms of pleasurable indulgence every month. Every automobile driver would jump at the bargain of 20 gallons of gasoline for $3.00. Yet that amount of money would represent only 250 or 300 miles of driving, scarcely enough for a weekend trip. Why doesn't that same $3.00 which would buy a month's good lighting for his home, 30 evenings of radio entertainment, fuel for the percolator, toaster, waffle iron, a daily efficient cleaning service from the vacuum cleaner, accurate time and power for a dozen other smaller devices around his home appeal to him as the still greater bargain that it really is?

Perhaps the idea of electrical yardstick isn't so bad after all — only it should be a yardstick of service and designed for the customer's use and not for the industry. Our job would be to get the customer to use the yardstick of service—to measure the service that he demands and gets from the modern genii, electricity — to realize that in practically every home electricity is on the job and working to keep time, preserve food and regulate temperature 24 hours every day and is called upon for instantaneous response in hundreds of other ways to heat, cook, light, provide entertainment, clean, wash, iron and even reproduce the rays of the sun. Perhaps a yardstick would help build a greater appreciation of not only the strength and versatility of the electrical servant but also of the extremely low wages for which he works. Even out of this pittance, he returns more than one-sixth to his employer, Mr. and Mrs. Public, as taxes.

Upon thinking it over further, there appears to be a real need for a yardstick of this type. Here is a suggestion. Who will improve upon it and suggest a way to sell a bargain to a Yankee?



Engineering Symposium + + +

[A monthly forum in which engineers will present and discuss their problems, this department is dedicated to advancing the art of power generation, transmission, distribution and utilization]

Twin Falls Hydro-Electric Development*

Idaho Power Company's New Hydro Plant On the Snake River Incorporates Unusual Design Features. Sliding Joint Permits Arch Dam to Adjust Itself to Load Changes. Powerhouse Built Below Station Yard Level. Control and Alarm System Simplify Operating Procedure

By H. L. SENGER
Idaho Power Company

IDAHO POWER COMPANY has recently completed a 9,375-kva. hydro-electric development at Twin Falls, on Snake River, about nine miles northeast of the city of Twin Falls, Idaho. This project is known as "Twin Falls," deriving its name from the twin falls in the river. It is the fifth development of Idaho Power Company on the Snake River in Idaho, and there are three additional developments on tributary streams. About four miles downstream from the Twin Falls plant is the Shoshone Falls plant, with an operating head of 212 ft., the backwater from which is less than a mile below the tailwater of the Twin Falls plant. The completion of the Twin Falls plant makes it possible to utilize more fully the fall of the river in this section. The Twin Falls plant, which now has a head of 147 ft. and a generating capacity of 9,375 kva., can be changed by increasing the height of its dams to provide 179 ft. of head, thereby increasing the generating capacity of the present unit to 13,500 kva. The Twin Falls project is not primarily a storage proposition, but contrasted to the company's three run-of-river plants on Snake River and the three plants on tributary streams, has a small pondage for daily regulation. The Twin Falls dams, as constructed, form a small lake in the Snake River canyon of about 1,000 acre-ft. available storage to supplement stream flow.

*A report prepared for Production and Generation Committee, Engineering and Operation Section, Northwest Electric Light & Power Association, for presentation at 1936 Annual Section Meeting.

River Regulation

The Snake River above Shoshone Falls is a highly regulated stream, its waters being used primarily for irrigation. The Jackson Lake Reservoir near the headwaters of the stream has a capacity of 847,000 acre-ft. The Blackfoot Reservoir on the Blackfoot River, a tributary of Snake River, has a capacity of 409,000 acre-ft. The American Falls Reservoir and Lake Walcott, both on Snake River above Twin Falls and near Minidoka, have capacities of 1,700,000 and 107,000 acre-ft. respectively. The combined developed storage space of these and other reservoirs in the drainage area above Shoshone Falls is approximately 2,859,000 acre-ft. At Milner Dam, located about 22 miles above Twin Falls, the final diversion of substantially all water in Snake River is made into three large irrigation canals, having a combined capacity of 8,000 sec.-ft. The Snake River immediately below Milner Dam for the greater part of the time is practically dry, the measured loss by seepage and leakage being as low at 10 sec.-ft. The regulation of Snake River flow above Milner Dam for irrigation has been such as to eliminate flood run-off below

View of Twin Falls development showing (left) the arch type dam across the main channel and (right) the station yard made by filling behind the rock wall constructed from the river bed to an elevation equal to maximum high water. Only the roof of the power house, the Gantry crane, the transformer and switch rack are visible above ground

this point of diversion for the past five years. Practically speaking, Snake River starts anew at Milner Dam. It is a remarkable coincidence that immediately below this dam Snake River plunges into a canyon, where it remains unmolested by diversions for irrigation uses other than pumping installations for two hundred miles, and when it again emerges from this rock walled canyon it has replenished its supply from springs, drainage, and return irrigation water with 7,000 sec.-ft. of water.

At Twin Falls the accumulated minimum flow from return irrigation water and springs varied from 444 sec.-ft. in the year 1930 to 320 sec.-ft. in the year 1935. The monthly average flow rarely exceeds 500 sec.-ft. This condition applies throughout the year, excepting for occasional periods of flood and water released to the river below Milner Dam. On October 1, 1934, the Idaho Power Company entered into a contract with the United States Department of the Interior, Bureau of Reclamation, which includes the Snake River Valley Projects and the Owyhee Project, for conservation of Snake River water and the furnishing of transmission service.

The provisions of this contract are such that through the coordinated use of the combined power plant facilities of the United States and the Idaho Power Company, a saving of approximately 150,000 acre-ft. of Snake River water can be effected in the American Falls reservoir for irrigation purposes during the summer months.

Idaho Power Company has a contractual primary right to the release of 45,000 acre-ft. from the American Falls Reservoir which it may release as the exigencies of its system operations may require. It also has a secondary contractual right by virtue of which water from American Falls Reservoir may be used below Milner Dam, and which at present is limited to make the total flow at the head of Shoshone Falls at certain stipulated amounts from October 1 to March 15, inclusive. The Twin Falls plant, therefore, may be said to be dependent for its water supply upon that water returning to, or arising within, the 22 miles of river bed between Milner Dam and that plant, with the addition of such limited amounts of water permitted under contract to flow by Milner Dam.

Natural Conditions

Twin Falls is in a deep rock-walled canyon 400 to 500 ft. deep. The geological formation of this region shows that it is a built-up plain formed principally of lava sheets deeply dissected by the Snake River canyon. At Twin Falls a sheet of lava a thousand or more feet wide and of unknown depth lies athwart the bottom of the canyon nearly 400 ft. below its rim. The natural falls at this point are 130 ft. high. An island of solid rock having its lower extremity at the rim of the falls divides the stream bed into two channels, the principal one being on the right or north side of the river. This channel is split by a deeply eroded crevice of sufficient capacity to carry the regulated low flow of the river thus leaving the remainder of the original stream bed dry. Below the north falls there is a pool of unexplored depth; that below the south falls measured 62 ft. deep. These pools were separated with a ledge of solid rock maintaining the water level in the south pool 6 ft. above the level of the main stream. The south falls under present conditions discharges a small amount of seepage water reaching this channel from the south wall of the canyon.

General Plan

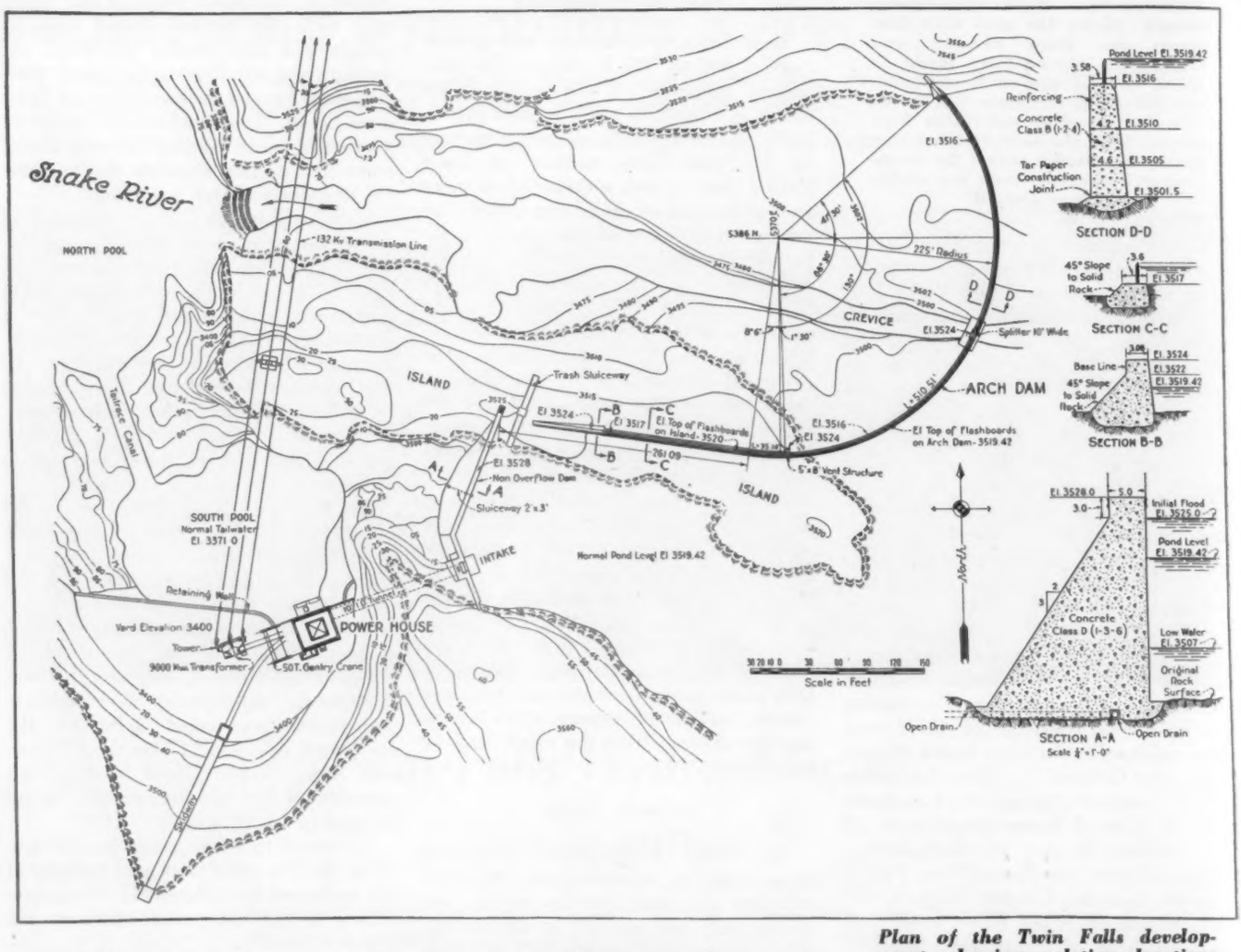
The entire development comprised seven units or sub-divisions; the construction of a road into the canyon, retaining wall and yard fill for substation, power house and substation, an arch dam in the north channel, gravity dam and headworks of power house in the south channel, penstock, and tail race.

The station is shaped in the form of a square; the generating unit being placed in the main body of the structure with the control board cubicle, pumps and compressor, governor, air washer and auxiliary equipment conveniently located on the main and basement floors. This machine is a complete generating unit, having its own direct connected exciter, separate station service transformer and bus layout. There is no provision for a spare exciter. The terminals of each of the three phases are brought out and the windings connected "Y" and this neutral assembled to connect with ground bus through a disconnect switch. Current transformers are placed in each line between the machine and neutral and afford means of differential protection. The circuit of the main generator bus is through an oil circuit breaker and disconnecting switches to the main transformer.

No provision is made to remove the oil circuit breaker from service while in operation. Current to auxiliary transformer is supplied from line side of disconnecting switch. Through this system of switching equipment the machine is connected to the low tension side of a power transformer, consisting of one 9,000-kva., three-phase Westinghouse transformer connected delta on the 6,600-volt side and "Y" on the 132,000-volt side. With forced cooling the capacity of the transformer can be increased to 13,500 kva.

In regard to relay protection the machine and its auxiliaries and equipment are protected by differential relays connected to current transformers in the

Airplane view of the Twin Falls site in the irrigation season when gates of Milner Dam, 22 miles above, are shut down for maximum diversion. Note the natural formation readily adapts itself to a hydraulic development at this spot



Plan of the Twin Falls development showing relative locations and elevations of the principal elements. At the right are sections of the arch and concrete gravity dams, the unique feature of the former being the sliding tar-paper joint illustrated by section "D-D"

neutral side of the machine and in the main generator leads. Also a combination for similar protection is provided for the power transformer by bushing type current transformers in the high tension side of the power transformer. Any unbalancing of the phase currents due to faults such as grounds, short circuits or open circuits will cause all equipment to be opened at once and the machine to be completely cleared from the line.

The generating unit is remotely controlled from the Shoshone Falls plant by means of a 6 pair lead covered cable 25,000 ft. long. The operator at Shoshone Falls may know the elevation of storage pond at Twin Falls, turbine gate opening, kw.-hr. output, hourly kw. peak and may open the oil switch and close the turbine gates. The plant at Twin Falls is single man operated. A complete alarm system will warn the operator whether in or within the vicinity of the plant, of any impending necessity for his immediate attention.

The engineering department of Ebasco Services, Incorporated, in New York made the studies, the general layout and the detail plans for all of the structures on this project. The field design work, engineering and construction organization was furnished by the engineering department of the Idaho Power Company, Boise, Idaho. A large part of the construction was done by contract including the two dams, penstock tunnel, yard and tail race excavation, diamond drilling for foundation grouting, and operator's cottage. The major part of all labor was secured from local communities in the immediate vicinity thereby supplying very substantial relief to the then prevailing unmeployment situation.

The plant, ready for commercial operation, was completed in the remarkably short time of practically seven months. The building of the canyon road was started on April 27, 1935, and the plant placed in operation on December 3 of the same year.

PRINCIPAL CONSTRUCTION FEATURES

Road Into Canyon—The power site is in a very rugged portion of Snake River canyon accessible only at favorable points by foot trail. Before any work could be accomplished it became necessary to build a road suitable for hauling heavy equipment into the canyon. The road is 16 ft. wide and heavily graveled on light soil. The maximum grade is 14 per cent where the roadway is blasted out of the solid canyon wall. The road is more than a mile long. From the canyon rim to the lower bench above the power house yard it is one-half mile long. From this point a skidway having a capacity of 40 tons connects with the power house yard. The skidway is about 230 ft. long set on a slope of approximately 45 deg. The movable skip with strap iron shoes slides on heavy timbers securely fastened to concrete foundations on solid rock. It is operated with a 125 hp. motor equipped with drum, and suitable for 7 part steel rope ¾ in. in diameter.

Retaining Wall and Yard Fill for Substation—The power house and substation yard is located at the south edge of the deep pool below the south falls. This alcove is surrounded with lava rock cliffs 200 ft. high. These cliffs were badly weathered, necessitating heavy excavation to stabilize the ledge rock for protection of the power house

structure to be built in proximity to its foot. A large amount of talus accumulated during the years added to excavations from the cliff. The yard level for substation and utility space was made at high water mark, which, due to the restricted channel in the river canyon downstream, reaches at times 30 ft. above low water stage below the north falls. It is 87 ft. from the yard level to the bottom of the south pool, necessitating a high rock wall to sustain the yard fill. This wall, built on a batter of 2 to 1, has a maximum height of 65 ft. The foundations for transformer and gantry crane are within this fill and are built up of hand laid rock from a solid foundation. The yard fill also encompasses the power house structure on three sides. A track with traveling car affords transportation for heavy pieces from the foot of the skidway to the Gantry crane.

Power House and Substation

Structures—The power house is of reinforced concrete built below the station yard elevation, the north or tailrace side being the only one exposed. Entrance to the building is by means of a stair well on the south side. The building is 52 ft. high, 34 ft. long, and 31 ft. wide, and extends 3 ft. above ground level. The basement is 9 ft. 3 in. high and the operating room 12 ft. 6 in. high. A hatchway in the roof, 18 ft. square, provides an opening for the handling of station equipment by the Gantry crane. The hatchway cover is of structural steel. The operating room has three windows on the tailrace side, with provision made to close these openings tight during flood periods. All window sashes and frames are of steel.

The doors and door frames are Kalameine.

Ventilation of the building is accomplished by means of an air duct on the south side of the building, which enters the basement and connects with a 7,000 cu.-ft.-per-minute air washer. The generator bus compartment, exciter field rheostat and contacter panel, 100 kva. 3 phase, local service transformer, cooling water piping, governor oil piping and governor oil sump tank are located in the basement. Access to the turbine pit and turbine gate operating mechanism is from the basement floor.

All seepage water is collected into a sump located on the east side of the building. This sump extends 16 ft. 9 in. below the basement floor. A penstock drain also connects with this sump, the water from which is removed by two vertical pumps. Access to the draft tube is had from this sump.

On the operating room floor are located the generator, switchboard cubicle, governor, governor oil pump and pressure tank, sump pump motors and laboratory.

All interior walls and ceilings are painted with a gloss paint. On the side walls is an olive green dado ending three feet above the floor. In contrast with the dado the walls above are light buff to within 18 in. of the ceiling. The ceilings are painted a cream color extending down on the side walls 18 in. and joining the side wall color with a 3-in. strip of olive green.

The substation structure consists of two galvanized steel latticed columns 25 ft. high, framed together at the top with channels for supporting the 161 kv. line switch. This structure also provides the dead-end for the transmission line connection, and the high tension connection to the main transformer.

Electrical Equipment and Auxilliaries

Grounding System—The grounding system consists of two grids; one of 500 ft. of 250,000 circ. mil stranded copper cable buried in the south pool, and the other 750 ft. of like cable under the south channel dam. These two grids are connected with two runs of 250,000 circ. mil cable located in the concrete backing of the penstock liner and welded to it at the upper and lower ends. The two overhead transmission line ground wires are carried over the south falls alcove and deadended near the top of the skidway. The overhead ground wires are connected to this grid system at two points with 250,000 circ. mil copper cable; one from the point of deadend to the grid in the south pool and the other from the steel transmission structure on the island to that under the south channel dam.

Generator—The generator is a General Electric Company vertical water wheel driven type, rated at 13,500 kw., unity p.f., 240 r.p.m., 6,900 volt, 3 phase, 60 cycles, with a direct connected 75-kw., 125 volt d.c. main exciter and a 3-kw., 125 volt d.c. pilot exciter. The generator is also rated at 9,375 kva., 8,437 kw., 0.9 p.f. based on 60 deg. C. rise of both rotor and stator with 70 deg. F. cooling water. The weight of the generator rotor, hydraulic equipment and hydraulic thrust, amounting to approximately 100 tons, is carried by a 41-in., water cooled Kingsbury thrust bearing. The generator is also equipped with an upper and lower guide bearing. The Kingsbury bearing is supported on the lower generator bracket. The generator neutral is brought out for differential relay protection and solidly grounded to the station grounding system.

This generator is self-ventilating. The air passes downward through the rotor and stator and is returned upward through a completely closed duct system located on opposite sides of the generator. Each ventilating duct is equipped with a surface air cooler. Cooling water can be furnished either from the penstock or a natural spring. The ventilating ducts are provided with dampers arranged to circulate air through the operating room in cold weather.

The generator is equipped with the following instruments and alarms: Venturi type water-flow indicator with alarm contacts for thrust bearing; Venturi type oil flow indicator with alarm contacts for guide bearing; low oil level alarm on thrust bearing; Foxboro dial type indicating thermometers with alarm contacts for the north air cooler, south air cooler, upper guide bearing, middle guide bearing, and for the thrust bearing shoe. A relay bulb located in one of the thrust bearing shoes will trip the generator oil switch and field switch in the event of high temperatures in the thrust bearing. The unit remains operating at synchronous speed. The stator winding is equipped with six temperature exploring coils. Four of these coils are used to read stator temperatures and and two are used to operate an alarm circuit and remove the machine from service in the event of high temperatures. After the machine is disconnected from the system it is left running at synchronous speed.

Turbine—The turbine, furnished by the Allis Chalmers Manufacturing Company, is a vertical shaft, single runner, wicket gate turbine, with a rated capacity of 13,300 hp. at 240 r.p.m. under a 142-ft. head. The turbine will develop 19,000 hp. at 240 r.p.m. under a 179-ft. head. The mean diameter of the runner is 76 in. The casing is of spiral form fabricated from rolled steel plates forming a series of conical sections joined together by means of double riveted lap joints. The joints to the speed ring are triple riveted lap joints. The main shaft guide bearing is oil lubricated. Lubrication is accomplished by means of a circulating oil pump driven from the main shaft through gears. The oil reservoir is located in the cover plate extension below the bearing. An auxiliary motor driven pump arranged to start automatically in case of failure of the gear driven pump is provided to maintain the circulation.

The Allis Chalmers Manufacturing Company governor is of the oil pressure actuator type. Flyballs are of the new high-speed, super-sensitive design. The flyball drive consists of a direct connected synchronous type motor responding to a frequency change with a slip or lag of less than 0.02 per cent.

The ratio of speed variations from no load to full load can be adjusted from 6 per cent down to zero. The closing and opening time of the governor for the full stroke is 3 seconds. The rise in speed for 100 per cent load thrown off will not be more than 43.5 per cent. The governor is also guaranteed to be sensitive to a speed variation of 0.1 per cent.

Transformers—The main transformer, furnished by the Westinghouse Electric and Manufacturing Company, is a 9,000-kva., 3 phase, 60 cycle, outdoor type, self-cooled transformer, 138,000 to 6,600 volts. This transformer is connected "Y" on the high tension side and delta on the low. The high tension neutral is solidly grounded to the station ground system through a 50/5 ampere, 15,000 volt outdoor current transformer. The current transformer is used in relaying for ground faults. The high tension bushings of the transformer are equipped with bushing current transformers of standard multi-tap design which are used to operate differential relays.

A 100-kva., 3 phase, 60 cycle, 6900-240 volt distribution transformer is used for local service.

Switching Equipment—The switching equipment consists of a 15,000-volt, 1,200-ampere, 100,000-kva., interrupting capacity, 3-pole, single throw, hand operated oil switch for generator control, together with a 3-pole, single throw, motor operated, 161,000-volt, 600-ampere, air break switch for connecting the 3-phase transformer to the line.

The switchboard consists of a steel cubicle with hinged front instrument panel, one vertical relay panel and one swinging bracket. The generator oil switch and instrument transformers are mounted inside the cubicle.

The relay protection of the electrical equipment consists of a differential loop around the generator and main transformer. A ground relay relieves the generator of load in the event of a transmission line ground.

The local service transformer is protected by over current relays which opens the generator oil switch, generator field switch, and transformer air break switch.

The voltage regulator is the exciter rheostatic type controlling the a. c. voltage by varying the resistance in the main exciter field by means of a motor operated rheostat. For small deviations from normal voltage the regulator operates to change the position of the exciter field rheostat, thus effecting the required change in exciter field current to bring the generator a. c. voltage back to normal. For large deviations from normal voltage, the regulator operates through high speed contactors to insert or short circuit suitable blocks of resistance in the exciter field circuit, thus effecting a relatively large change in the exciter field circuit, at the same time moving the rheostat to a new position. The voltage regulator main control element is energized from a 3-phase rectox unit that is supplied from two 1½-kw. transformers connected to the generator leads.

Local Service—Local service can be supplied from the 100-kva., 3-phase transformer in the station or from the rural 11-kv. distribution line by three 50-kva., 6900-230-volt transformers. Power for the station auxiliaries is distributed from a load center panel equipped with enclosed type 3-pole air circuit breakers. These breakers are arranged with a 3-pole thermal tripping unit and instantaneous magnetic trip for short circuit protection. Power for lighting is also supplied from the local service panel by an air-cooled 230-230/115-volt transformer.

Crane—A three-motor, four-wheel Gantry crane of 50-ton capacity is provided for the handling of all heavy equipment. The crane has a span of 34 ft. 11 in. and a hook travel of 34 ft. above the crane rails. The north and south walls of the power house supports the crane runway rails which extend 40 ft. to the west of the power house, providing storage and working space that can be reached by the crane.

Control Circuit—A control circuit consisting of a 6-pair lead covered cable connects the Twin Falls plant with the Shoshone Falls plant. This circuit is approximately 4.75 miles long. This control circuit registers at Shoshone Falls the kw.hr. output hourly kw. peak, turbine gate openings, head water elevation, and provides means for opening the generator oil switch and field switch, and also raising or lowering the speed of the unit at Twin Falls. The gate position and head water indicators are operated by the rheostatic type of transmitter.

The control switch at Shoshone operates to trip a multi-contact relay on the Twin Falls switchboard panel which opens the generator oil circuit breaker and the exciter field switch. A separate drop in an annunciator at Twin Falls indicates this operation to distinguish it from a similar operation caused by the differential relays.

Hydrostatic Gauges—A head water gauge is installed at the intake consisting of a rheostat with float and counterweight. The float actuates the rheostat which is connected to voltmeters at the power house and at Shoshone Falls. The voltmeters are calibrated to read water levels direct.

A Republic manometer-type, differential pressure gauge is located at the intake. The gauge is so arranged that when there is a difference in head between the reservoir and screen chamber, indicating clogging of the screens, an alarm will be sounded in the power house. The gauge can be set to indicate a difference in head of 4, 6, 8, or 10 in. A Gurley float gauge is installed in the operating rooms to indicate tail water elevation.

The flow of water through the turbine is determined by the Winter-Kennedy system. A Foxboro flow meter connected to piezometer pipes in the turbine scroll case indicates the second feet flowing.

Transmission Line—A 132-kv. transmission line approximately 5,500 ft. long connects with the American Falls-Shoshone Falls 132-kv. line. The structures are 2-pole "H"-frame type, constructed of 50-ft. poles with standard spacing of 600 ft. Two 3-in.x10-in.x29-ft. Douglas fir cross-arms, bolted on either side of the poles, support the 250,000-circ. mil stranded, copper-cable conductors with strings of 10 suspension insulators. Three self-supporting, galvanized-steel structures are used, one at the junction of the two lines and two for the long river span.

Dams and Water Ways

Arch Dam, North Channel—The north channel of the river is closed with a reinforced concrete arch dam 5 ft. thick at the base and 3 ft. 7 in. at the top. The dam is 14 ft. 6 in. high and 510 ft. long measured along the arch. The radius of its downstream face is 225 ft. This dam carries wooden flashboards 3 ft. 5 in. high which are supported by galvanized pipes set in vertical sockets left in the top of the dam. The flashboard sections are 12 ft. long. Each single 12-ft. section is supported at either end with a 2½-in. galvanized pipe. Between these are three additional galvanized pipe supports. The intermediate pipe supports are 2½-in. in diameter for two panels or 24 ft., alternated with 2-in. pipe supports for the adjoining two panels.

These supporting pipes are designed to bend or break and release the flashboards when the depth of water reaches a predetermined height. Each alternate 24-ft. section supported with the 2-in. pipe should be first to yield, thus obtaining the more uniform loading on the arch dam during the emergency release of flashboards.

The height of the dam with flashboards is 17 ft. 11 in. The pondage is about 1,000 acre-ft. To complete the foundation it was necessary to close a crevice in the north channel 30 to 35 ft. deep. A temporary by-pass trench was excavated around this area, the

crevice above closed with a temporary earth dam and the river diverted, making it possible to explore the crevice and place a concrete plug large enough to provide a foundation for the arch dam.

The top face of the foundation is 6 ft. wide and is laid to a uniform level. The dam above the foundation was built up of 1:2:4 concrete in blocks 30 ft. long poured monolithically from base to top of dam. A keyway 4 in. deep was provided in each end of the construction blocks which were separated from each other by an opening 2 ft. wide. These blocks were reinforced with ten 1-in. round reinforcing bars located in the top 4 ft. 6 in. of the dam and eight rods of like dimension in the bottom 3 ft. of the dam. These rods overlap in the openings between blocks. The 30-ft. blocks adjoining each abutment have four additional rods at the base and are keyed to the concrete and rock foundation with twenty 1-in. round dowels. The concrete blocks were cooled with a water spray and allowed to stand as long as possible before finally closing the 24-in. openings. Following a carefully developed plan all of the openings were poured monolithically and, as near as physically possible, at the same time. Corresponding reinforceing bars overlapping in the openings were welded together a short time in advance of pouring concrete, making each a continuous bar throughout the length of the dam. The openings were closed during cold weather and within a period of time having the least temperature change, the purpose being to include a maximum of concrete within the arch section and permit the concrete plugs to become sufficiently set before being subjected to stress.

A unique feature of this arch dam is the sliding joint with its foundation; the base of the arch and foundation being separated with a sheet of tar paper. The arch is left free to adjust itself to load and temperature changes. A movement of about one-third inch has been measured.

Free access for air into the space underneath the falling sheet of water is provided by two vent structures at each end of the dam. Near the center a "splitter" or section of concrete 10 ft. wide is carried up an additional 8 ft. This splits the water and permits air to flow beneath.

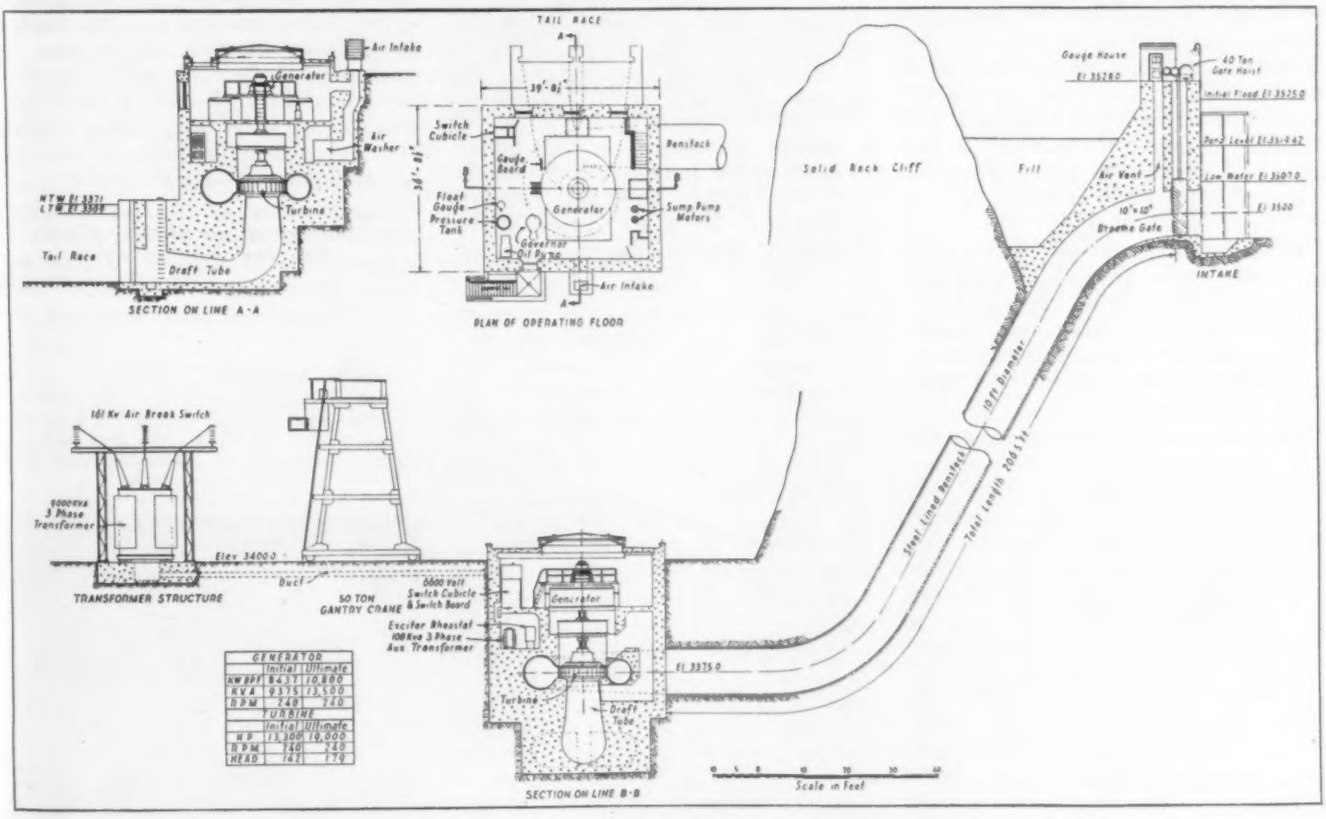
Gravity Dam and Power House Headworks, South Channel—The south channel dam is built of mass concrete. It is 28 ft. high, gravity type, within which is included the intake structure where water flow is controlled into a tunnel penstock. This dam, about 200 ft. long, closes the channel between the island and the south bank of the river. The top width is 5 ft. with a maximum thickness of 26 ft. at the base. The upstream face is vertical; the downstream on a batter of 2 to 3. A sluiceway 2 ft. by 3 ft. in dimension through the base of the dam is controlled by a steel gate operated with a hand operated hoist.

An open drain 12 in. square runs parallel to, and 4 ft. from the upstream face of the dam. This drain is open to the bedrock. Connecting with this at right angles and spaced at about 25-ft. intervals additional open drains are brought out under the dam through its downstream face. A sluiceway channel 6 ft. wide is excavated through the island for disposal of trash accumulations at the intake. The intake gate opening through the dam is 10 ft. by 10 ft. in dimension which is changed by a transition section to a circle which is 10 ft. in diameter at its juncture with the penstock.

A "Broome" self-closing sluice gate designed for a water head of 62.5 ft. is installed in the intake. The gate is operated in a vertical position with a Phillips and Davies electrical hoist.

Penstock—The penstock tunnel is lined with an electrically-welded steel pipe for a distance of 180.5 ft. measured from its lower end. This pipe has an inside diameter of 10 ft. and varies in thickness from ¼ to ⅜ of an inch. The tunnel was excavated through the rock cliff adjacent to the power house on a slope about 60 deg.

Cross-section of the Twin Falls powerhouse, penstock and gravity dam across the south channel with section and plan of the powerhouse proper. Note that practically the entire power house is below the level of the station yard



to the horizontal and has suitable curves on either end for connection to the turbine scroll case and intake.

The space between the rock walls of the tunnel and the steel liner is filled with concrete. The tunnel is 206.51 ft. long.

Tailrace—The excavation of a tailrace canal through the ledge rock separating the river pools beneath the falls lowered the natural water level in the south pool about 6 ft. This canal is about 190 ft. long, 18 ft. wide at its base, has side slopes of 1 to 4, and a depth of 9 ft. at normal low water. Water discharged from the turbine flows through the south pool and tailrace canal to the river.

Other Features

Diamond Drilling and Grouting—Before construction work was started no diamond drill holes were sunk in the area occupied by the two dams. The stratification and nature of the rock was clearly exposed at the falls and it was predicted, since the dam structures were built in such close proximity, that no material change should be expected in foundation formations within the area occupied. A detailed surface inspection was possible because practically all of the river bed was exposed due to the complete diversion of the river for irrigation uses at Milner Dam located 22 miles upstream. More than 7600 sacks of cement were pumped into the 11,175 lineal ft. of holes drilled.

Drilling of holes was carried on during the period of construction of the dams which was followed with grouting operations after the structures were partially completed. The foundation rock is a basalt of good texture, weighing about 196 lb. per cu. ft. Especial care was exercised while grouting the foundations under the arch dams and particularly its abutments. Grouting of foundations under the gravity dam was extended along the cliff above the power house to cut off seepage flow and thus prevent loosening of surface rock during the freezing weather.

Scenic Attraction—The Twin Falls site is located in a very picturesque and rugged portion of the Snake River canyon. The shadows of the canyon walls are sharply outlined and appear black with the intense light reflected by the noonday sun, but as evening approaches there is a gradual change from glare to softened shadows until the vast canyon is flooded with all the rich and varied shades of violet and purple so peculiar to arid lands. As the sun sinks lower the shadows deepen and fade in this resplendent coloring and one may give fancy full reign and enjoy without stint the luring beauty of this canyon retreat. Many visitors are attracted to this spot, and for their enjoyment and pleasure, trees, grass, and shrubs will be arranged in harmonizing effects to add to the beauty of the natural surroundings.

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New Ideas Cut Costs of Underground Distribution

By C. R. MACHEN and A. W. FLIPPIN
East Bay Division
Pacific Gas and Electric Co.,

BECAUSE of a street improvement project undertaken by the City of Piedmont, California, it was desirable that the existing pole line of Moraga Avenue be removed and underground service substituted. Inasmuch as the demand for residential underground of this character has increased in the past few years and will probably continue to increase in the future, it was necessary to inaugurate a change in the usual underground distribution costs.

In the system to be described a start has been made, and while probably none of the innovations are completely new and untried it is believed the design represents a distinct change from standard practice as far as the Pacific Coast is concerned.

The job was done in two parts; the first part consisting of a short section east of Monticello Avenue (see diagram) and the second part consisting of a rather long section between Romona Avenue and Monticello Avenue. It was necessary to take care of only the south side of the street since a cemetery fronts along the north side. The first section supplies four houses of which have electric ranges while the second section supplies eleven houses of which three have electric ranges. The entire system is installed in the sidewalk area. Figure 1 shows the general arrangement.

Conduit System

The conduit system consists of a 2½-in. cement and asbestos conduit buried 18 in. deep and located in the sidewalk area. Two feet by three feet creosoted wooden curb holes are buried in the ground at suitable intervals and are used as splicing chambers for service laterals and transformer connections to the primary and secondary mains. Where street crossings were necessary (in the first section only) iron pipe was used in place of the cement and asbestos conduit. Because of the necessity of supplying a 3-phase bank of transformers located in the cemetery two conduits were required in the first section of the job. By looking closely at the photograph in Fig. 2 the cement and asbestos conduit can be seen at the bottom of the ditch, while the photograph of Figs. 3 and 4 show the wooden curb holes before being buried. The top of the curb holes is approximately 9 inches below the surface.

Fig. 1.—Plan of low-cost underground system installed by Pacific Gas and Electric Co.

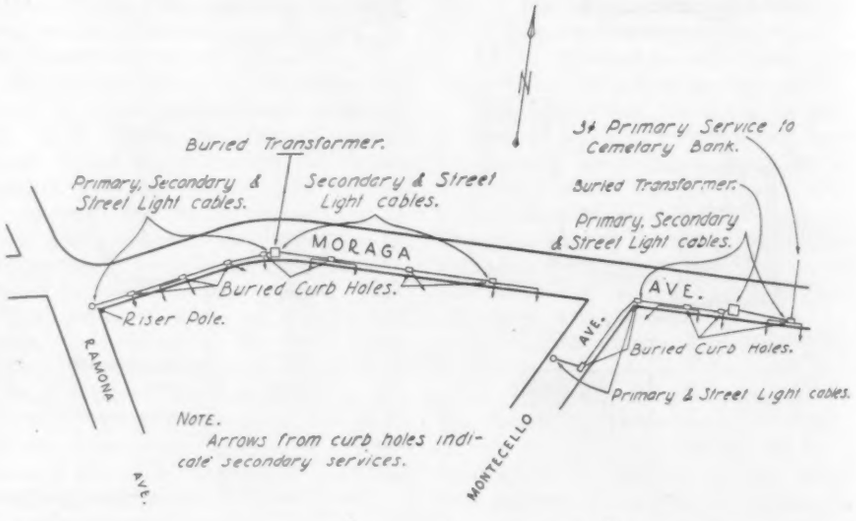


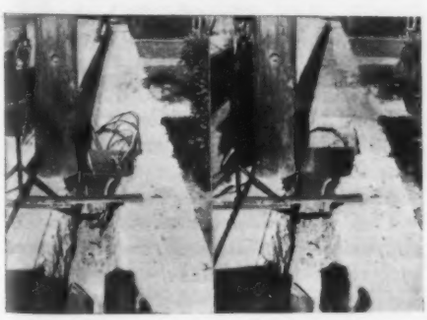
Fig. 2.—The cable is laid in a shallow trench excavated under the sidewalk which was replaced as shown in Fig. 10

Cable System

The cable system consists of a single phase primary, 3-wire, single-phase secondary, and a low voltage series street light circuit. The neutral is common to all circuits and all of the cables are installed in the same conduit.

The primary cable is a standard No. 10 rubber-insulated, lead-covered cable insulated for 4500 volts. The cable terminates on the riser pole in a 60-amp. porcelain cutout, no pothead being used. To accomplish this the lead was stripped back from the cable a distance of about 1 ft., the insulation being covered with alternate layers of cotton tape and lacquer. Particular care was taken in applying the lacquer, the coating being successively built up until a smooth glassy surface was obtained. The photograph in Fig. 5 shows the riser pole arrangement. Note the absence of pothead arm and pothead. In order to avoid trouble with the improvised cable terminals in the future an inspection will be made every 6 months, at which time the cable insulation will be relacquered if necessary. Paper-insulated, lead-covered cable was installed from the buried transformer to the adjacent curb hole, where this cable was spliced to the rubber insulated primary cable. Standard lead splicers were used for joints.

Fig. 3.—(left) Redwood curb hole prior to cable installation and Fig. 4—(right) Curb hole with cable and top in place. The top is approximately 9 in. below the surface elevation



The secondary main is installed from the buried transformer each way to the farthest home and consists of two 1/0 standard lead-covered, rubber-insulated 600-volt cables in conjunction with the common neutral.

The service cable to each house is buried directly in the ground, no conduit being used. The cable consists of three No. 4 conductors, two of which are rubber insulated, the neutral being bare. A rubber belt surrounds the 3 conductors, with a galvanized steel tape covering the rubber belt with a final layer of jute covering the steel tape. This cable was installed to each house even though 3-wire service was not necessary at this time, thus obviating a service cable change in the future in the event of a range installation. Moreover, purchasing of cable was simplified. The service cable terminates in an outdoor meter socket located on the side of the house. Photographs shown in Figs. 6 and 7 are typical of the outdoor meter installation.

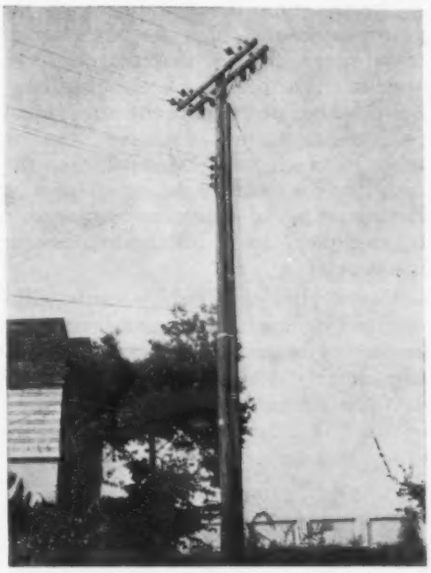
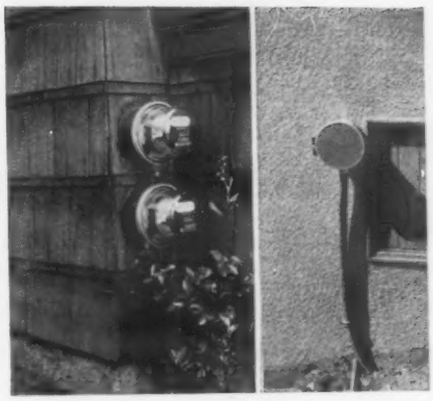


Fig. 5.—Riser pole from which primary supply for buried transformers is taken. Note the clean appearance and absence of potheads

Transformer Installation

Two transformers were installed, one for each section. Both transformers are the same, each being a 10-kw. 2400-120/240-volt buried type. The design is new and was worked out jointly by engineers of the manufacturer and the Pacific Gas and Electric Co. The tank is round, made of ¼-in. boiler plate, Parkerized and lacquered with the opening of such size that the core can be removed and replaced if necessary without removing the tank from the ground. The core is a standard 10-kw. design and is interchangeable with and can be replaced by a standard pole-type transformer core. The tank is 2-ft. 10⅜-in. high and 2-ft. 5½-in. in diameter and holds 60 gallons of oil. A heat test made on the transformer, when buried, before permanent installation resulted in temperature rise and losses as shown in the following table.



Figs. 6 and 7.—outdoor meter installations are made by bringing trench-lay cable to the meter socket

These figures indicate a liberal design with sufficient safety factor to permit carrying moderate overloads without undue heating. Operating temperatures have been checked since installation but the load on each transformer has been too small to cause temperature to equal the test values.

Figure 8 shows the transformer in the ground before cable connections were made. When installed, dirt is carefully tamped around the transformers to the top of the tank, the wiping nipples and cover being left uncovered. A concrete cap, built up on the job, was placed over the transformer and placed flush with the sidewalk grade, with a steel cover fastened to the concrete cap to provide access to the top

Fig. 8.—Buried transformer in place. Dirt is packed in to the top of the large diameter tank leaving nipples exposed. The top opening is large enough to enable removing the 10-kw. standard distribution-type windings and core without disturbing the main tank

Table I—Comparison of Losses on Buried Transformer

	Buried in Ground	In Air
Top oil rise	34 deg. C.	17.5 deg. C.
Coil Temperature rise		
High Voltage Winding	46.5 deg. C.	27.0 deg. C.
Low Voltage Winding	42.5 deg. C.	26.0 deg. C.
Losses		
Core Loss 120-V. 60-cycle	58.6-watts	58.6-watts
Copper Loss		
Full load 75 deg. C.	186.0-watts	186.0-watts

*Note—Manufacturers data.

of the transformer. This construction avoids tilting of the transformer on hilly streets.

Street Light System

The street light system consists of a low voltage series circuit supplied by means of a standard No. 8 lead-covered cable, the series transformer being

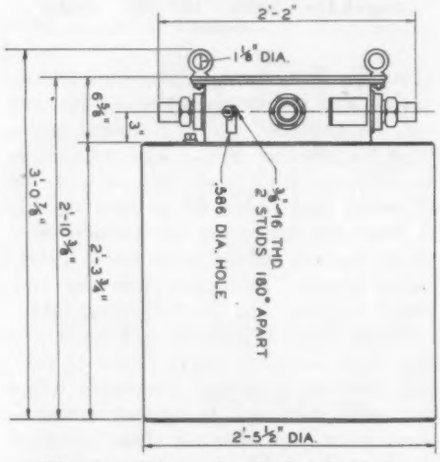


Fig. 9.—Dimensional sketch of the buried transformer used in the installation

mounted on the riser pole. Steel poles with an ornamental bracket were installed at suitable intervals. The street light pole is shown in the photograph in Fig. 9.

Cost Comparison

The original estimate made for this work contemplated the installation of two manholes for housing the transformers, with the usual subway accessories in conjunction with pipe and standard curb holes in the sidewalk area. Pipe was also to be laid to each house. The total estimated cost of this work, including transformers services and meters, was $10,700. This figure compares with a total cost of the job as installed of $7,500, including transformers services and meters. This reduced figure represents a saving of 30% over the original estimate. This saving was considered sufficient to justify the trial installation of what might be termed a "sub-standard" system. It is estimated that this figure is approximately 50% more than that of the equivalent overhead system to give the same service.

Due to the short time the installation has been in operation (since Nov., 1935) no statement can be made regarding the success or failure of the system. However, it is expected that the operating experience obtained from this installation will be of value in determining the suitability of the various features, such as the buried transformer, for use in more extensive systems. Further cost reductions have been found practicable in subsequent jobs by making use of precast concrete curb holes which are cheaper than the creosoted wooden holes and possess the advantage of being more accessible because they can be installed flush with the ground.

Use of high class rubber cable without lead or conduit has also been tried on later jobs and gives promise of being entirely successful. Single conductor mains and single conductor service cables make for simplicity in splicing. A bare or previously used weatherproof neutral is used throughout. Experience in the operation of such reduced cost systems will determine, in a large measure, how far one can go with such minimum systems before lack of service continuity and ease of operation are unduly sacrificed for reduced cost.

Fig. 10.—Street view after completing the low cost underground installation

EDITOR'S NOTE: The foregoing article represents a definite step forward toward the solution of one distribution problem. The project was undertaken frankly as an experiment from which valuable data could be obtained. It will form the basis of future design and permit operating data to be obtained from actual experience. A trite but true statement is that "you never know what you can do until you try." Practically every development of the electrical industry is to a degree the result of experimental installations. Progress is measured by the ability to correct permanently defects in equipment discovered in actual operation. To P. G. & E., for its progressive attitude, all credit.

Ice Used to Lower Electrical Duct System

An interesting and relatively inexpensive method of lowering a half mile of concrete duct system with cables installed was developed by the Brooklyn Edison Co. Municipal authorities decided to lower the right-of-way of the street in which the duct line ran approximately 3 ft. to secure better drainage. The duct line consisted of eight 4-in. fiber pipes encased in concrete carrying circuits of such importance that they could not be taken out of service unless bypass feeders were provided. The cost of installing the bypasses, breaking out the concrete and reconstructing the line at the lower elevation was estimated at nearly $90,000.

Because of the high expense involved in the relocation, other methods were studied and it was decided to attempt to lower the duct run in place by using blocks of ice. The theory behind this suggestion was that if cakes of ice were placed at intervals under the duct line and the supporting earth removed, the melting ice would lower the structure uniformly as a unit without inducing any great stresses in the concrete.

As the duct line and cables weighed approximately 250 lb. per ft. it was decided to support it with blocks of ice at 6-ft. intervals. Thus the weight on each ice support would be 1,500 lb. and if a normal stress of 40 lb. per sq. in. was allowed, a section of 37.5 sq. in. for the bearing surface of the ice was the minimum permitted. This working stress of 40 lb. per sq. in. was determined after tests on numerous blocks of commercial ice which showed that a normal surface pressure of 75 lb. per sq. in. caused the ice to fail to sheer along a plane 45 deg. to the normal.

In the actual lowering, commercial cakes of ice, cut in half to give a bearing surface of 420 sq. in. were used. The duct line was exposed for its entire length and cut loose from the ends of manholes. Holes large enough to insert the blocks of ice were dug under the line at 6-ft. intervals and the ice then placed under the line and packed to give the proper support. The remainder of the earth was removed and the line, then entirely supported by the blocks of ice, was lowered as the ice melted. Approximately 72 hours were required for the ice to melt down to a sectional area approaching the minimum and in this time the duct line itself had been lowered more than 19 in. Where more lowering was needed the process was repeated until the final gradient was obtained.

This method permitted a saving of approximately 50 per cent compared with the estimated labor and material required in the complete reconstruction

Inventors and Inventions

"I TOLD you that you should have gone to the Inventors' Congress with me," I said to Electra as I walked into our room at the Palace after the return trip from Oakland. "You won't ever see as many inventions again outside of the Patent Office."

"But I don't like inventors. They're all a bunch of nuts. You've said so yourself," she remarked as she sat up in bed. "Why when you were trying to invent that electrical cocktail shaker . ."

"This was different. These inventions were practical, that is, some of them were. Take the electric mouse trap for instance . . ."

"Don't tell me the world is finally going to beat a path . . ."

"There you go stooging again. It probably won't, but I am going to get one. You see this trap consists of a little cylindrical device made of porcelain and metal. It plugs right into an outlet. You put a piece of cheese inside and when the mouse goes in to get it, his nose closes the contact and he is electrocuted instantly."

"Great heavens! I won't have one in the house. Junior likes cheese too well," Electra reminded me. "Suppose he put his finger in it. It would be just like the electric chair."

"Oh, all right," I said to her, "but sometimes Junior acts enough like a criminal to deserve a good singeing. But even you would have appreciated the 'Remind-o-clock.' You set it in advance to do anything electrical that you want. It will remind you as often as forty-eight times a day. Why this thing remembers just so that you can forget. It will ring as many as a hundred bells. When you go to bed at night, you can set it to ring a bell to wake you up, to start the percolator and turn on the radio. In between times it will get you up to give Junior his midnight bottle, turn on the night lamp and even start the bottle warmer."

"If it will wake you up to feed him, let's get one," she said tartly.

"You know I sleep soundly," I replied, turning my head so that she would not see that I was lying. "However, this clock can be used in factories and offices too. It will sound bells or signals to indicate the noon hour, quitting time, or change of shifts, all automatically."

"Wouldn't it be funny if something happened to the clock and everything started at once," she mused.

"It can't because the clock is foolproof, self-starting and requires no attention except to set it," I told her. "Another thing they had that impressed me was an electric wiener roaster. It barbecued a wiener in 45 seconds. You put the sausage into a wire rack and slip it into a cylinder lined with heating elements."

"Hot dog!"

"Oh, stop wisecracking and listen. An electric burglar trap to capture bank bandits received a lot of attention. The bank has to use revolving doors. Directly in front of this revolving door there is a slot in the floor which conceals a second door which can come right up through the floor. Besides that, the revolving door is encircled with a tight cage one quarter of its circumference on both sides, leaving it open at the front and rear only. The money boxes in the cashiers' cages are wired with concealed switches.

"Now suppose a bandit comes into the bank through the revolving door. He walks up to the cashier and pulls his gun. If either the bandit or the cashier scoops any money out of the boxes, a switch is thrown which starts the machinery. A lock is automatically set on the revolving door. In addition the hidden door in front pops up through the floor. The bandit grabs the money and starts out of the bank. Into the revolving door he goes. It makes only one quarter of a turn and then locks tight. It won't revolve in either direction. In the meantime an alarm has rung in the police station. When the cops arrive, there is the bandit neatly trapped. Simple, isn't it?"

An electric mousetrap—will the world beat a path . . .

The "Remind - o - clock" performs forty-eight different operations

"Say, how many drinks did you have when you stopped in the bar on the way upstairs?" Electra asked.

"I didn't stop and I didn't have any and I know what you are trying to infer. If you had gone with me, you would have seen the burglar trap and I would not have to sit here trying to explain it to you.

"However, if you had had one of those electrically operated waterless medicated steam inhalators the last time you had a cold, you would have received a lot of relief. You put a cloth dampened with a medicated solution in the inhalator and the fumes are directed into the nose or ear. It was invented by a girl."

"Was she good looking? Is that why you noticed it?"

"Don't be so sarcastic. I didn't see her. The sign said that. But you would have been interested in a new electric hair clipper. It cuts up, down, diagonally or in curves. Its use would make a bum barber into a real artist."

"Well tell that ham who pretends to give you a haircut to get one," Electra observed.

"There was one invention that is going to revolutionize the entire electrical industry," I continued, ignoring the interruption. "It was a surf motor designed to generate electricity from the crash and impact of ocean waves. The model worked perfectly."

"Say why couldn't the government use a lot of those machines at Passamoquoddy?" Electra inquired.

"Oh what's the use of talking to you. You know too damned much."

"Thanks," she said and turned over in bed and went to sleep.

Cooperation on Parade + + +

[*Forecast of forthcoming cooperative merchandising activities, and review of activities in progress or completed, a summary of cooperation at work throughout the West*]

Homewares Institute Solves Demonstration Problem

AS a bridge for that gap between the consumer and the manufacturer of high grade appliances and homewares, a novel institute has been started in San Francisco. It also plans to extend its activities to the entire Pacific Coast.

Known as the Western Homewares Institute, the organization was started by D. J. Bartelme, former major appliance salesman, Pacific Gas and Electric Co., and Miss Aliss McKay. Its purposes are twofold. First, it provides the manufacturer with a demonstration and sales program in conjunction with other homewares of a non-competitive nature which, to finance by himself, would cost considerably more. Second, it provides the consumer with an approval certificate guaranteeing the quality and serviceability of the appliances sponsored by the institute. Leading department and hardware stores of northern California have eagerly accepted the services of this new institute as a means of promoting the better grades of electrical and other homewares.

The organization first makes a thorough test of each of the homewares to be endorsed by it. These tests are made by a corps of "the meanest women in the world" who subject the equipment to grilling tests. The standards set up include sound design, good materials, smart style, ease of use, fairly priced, American made, repairs available, money-back guarantee, a responsible maker, and tests for use in Western homes. Upon successfully passing these tests the item receives a certificate of endorsement and may use the Western Homewares insignia. The endorsement council also consists of prominent club women and the editors of the home economics pages of the daily newspapers.

Results of the tests are on file at the Institute headquarters, 138 Fourth St., San Francisco, for public reference. A build-up of public confidence in the field is being developed through newspaper, periodical and radio advertising. The manufacturers pay only the actual costs of conducting the tests.

Having successfully passed the quality test, the manufacturer can avail himself of the promotion and demonstration service. Display booths, with trained attendants, are maintained in principal department stores. The stores themselves pay for this service, the manufacturer paying only a small display charge depending upon whether the display is exclusively of his own

Typical display booth at which a demonstrator displays and operates approved appliances. This photo was taken in Weinstock-Tubin Co., Sacramento

appliance or in conjunction with two or with several other appliances.

Products are demonstrated and explained at these booths, but not sold. The selling is done in the regular departments of the store. Traveling displays are planned to cover the principal towns at intervals of a month. Advice in planning and placing of advertising, aimed specifically at the Western market, to back up the displays and demonstrations, will be made available.

Another feature of interest in developing the homewares is that the institute writes and sells a weekly column to newspapers in which latest devices are described but not named.

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Estimate Portland's Sales Reached Five Million

RETAIL value of domestic electric appliances sold in the Portland territory in 1935, including everything from incandescent lamps to ranges, amounted to $5,000,000 according to A. C. McMicken, General Sales Manager, Portland General Electric Co., recapitulating the year's activities at the annual meeting of the Portland Electric Club in January. This represented a substantial increase over the preceding year. Out of this total, Portland General Electric Co. sales amounted to a little less than $600,000, or 11 per cent of the gross volume.

These figures were presented by Mr. McMicken as the best estimates that could be made, and they were cited in connection with a summary of cooperative activities carried on by the Portland General Electric Co. and Northwestern Electric Co. on behalf of appliance sales generally. Major items of promotion expense were stated to be $48,000 of appliance advertising by Portland General Electric Co. and $32,000 by Northwestern Electric Co., totalling $80,000, and $100,000 divided between the two companies in free electric range wiring.

Of Portland General Electric Co.'s advertising expenditure, $32,000 was devoted to general advertising for the benefit of retail outlets other than the company, and all of Northwestern Electric Co.'s advertising was of a similar character since that company sells no appliances.

Free range wiring jobs totalled 3,514, of which about 2,700 were to connect new ranges, the other 800 jobs being for old ranges removed from service during the process of changing residences and not having the ranges connected in the rented premises.

Much of the advertising of both companies was devoted to refrigeration, and Mr. McMicken estimated that approximately 9,000 electric refrigerators, having total retail value of $1,608,000, were sold on the lines of the two companies during the year. Of this business the dealers other than the utility did more than 90 per cent.

A considerable volume of advertising on the Better Light-Better Sight movement featuring I.E.S. lamps produced the largest volume in this class of merchandise yet recorded. Mr. McMicken estimated between 8,000 and 9,000 study and floor type I.E.S. lamps were sold in the territory served by the two companies and that these lamps had a retail value of not less than $90,000.

He prophesied an even better year for 1936 and pointed particularly to the market for the two-unit, storage type, automatic electric water heater, which at present is used by only 2 per cent of the domestic customers on the lines of the two companies.

Northwest Association Analyzes Varied Sales Problems

SELLING of electricity has graduated from an amateur to a professional status in the Northwest. The scale and thoroughness—yet the amazing differences in the programs of the various member companies, demonstrated that no longer is activity narrow or limited. Important is the indication that not the utilities alone, but the entire industry is taking part in these result-producing sales programs of the aggressive utilities of the region.

Such an impression could not help being gained by the 272 men and women in attendance—largest registration in association records for a section conference. The occasion was the Business Development Section meeting of the Northwest Electric Light & Power Assn., March 5, 6 and 7, at Hotel Davenport, Spokane.

From the moment Section Chairman, W. C. Mainwaring, B. C. Electric Railway Co., launched the convention with a fight talk from Frank T. Post, president, The Washington Water Power Co., to Association President, Kinsey M. Robinson's closing admonition that they pass on to their associates at home what they had learned, the conference was one of facts, figures, plans, programs and inspiration.

Since most of the papers presented will be published in full in ELECTRICAL WEST'S Convention-in-Print in June only a few of the more significant remarks and discussions will be spotlighted here.

Rural electrification in the Northwest revealed itself as already developed beyond the dreams of the Administration at the Rural Sales Bureau session Thursday morning of whcih R. S. Overstreet, Idaho Power Co., was chairman. Scattered and limited farming valleys sandwiched between heavily timbered mountains in British Columbia present peculiar problems for load development, S. J. Bowman, B. C. Electric Railway Co., told in describing the company's thorough program of education by radio, pamphlet, and a staff of farm salesmen who know farming. Farmers, like good horses, find their own way home to the facts if given the reins, said D. B. Leonard, Pacific Power & Light Co., in relating investigations of the actual costs of building farm lines made by the Eastern Oregon Wheat League and Oregon Wool Growers Association. Estimates from independent contractors for pole line construction proved utility power line costs of around $1,000 per mile correct and indisputable. Average cost for line building as well as for service in the Pacific Northwest was demonstrated to be lower than the REA figures. In the most highly electrified rural area in the world, based on density of population and lowest rates, further rural electrification is only retarded by investment needed in equipment and wiring to utilize more electricity. F. E. Price, Oregon State College, telling of the unbiased information on costs disseminated by his department to inquiring farmers, advocated a break-down of costs so that they could be spread on the table for comparisons. Homer Beresford, Washington State College, opined that Northwestern power men had kicked up so much dust with their intensified rural electrification that REA had not yet been able to see how completely the job was done. Chairman Overstreet reported on revenue studies, showed that less than $182 of revenue per mile would mean a regular loss; that at least $230 per mile was needed to pay out.

Commercial and Industrial Sales Bureau, chairmaned by O. C. Mayer, Idaho Power Co., devoted the afternoon to penetrating analyses of this type of load building potential. A manual is in preparation analyzing commercial customers' percentages of business cost against power, for use in selling the correct perspective of these various items in doing business. L. B. Gawan, Utah Power & Light Co., pointed to the larger number of people buying autos and touring as indicating improved opportunities for sale of commercial cooking and baking equipment. Carl Hoffman, whose Washington Water Power Co. has just changed to an all-service selling program for salesmen, told how traveling display trucks of restaurant equipment, driven to the customer's door, hastened decision to buy; showed how a complete sales job could be done by one all-around man. Value of the third party—the dealers—in bringing about sales, the necessity of frequent calls to re-sell and keep in use, and a strong service policy to keep equipment in good condition and usable, he also stressed.

"Which was first, the hen or the egg?" asked A. K. Gaylord, Portland General Electric Co., in asking utilities to determine which was paramount, kw.-hr. or equipment. Bolstered by undeniable advantage to the utility in selling more commercial kw.-hr. Mr. Gaylord sprang several original ideas. First, manufacturers instead of applying the inherent automatic responsiveness of electric equipment have foolishly tried to compete with fuel ranges in square footage of cooking areas; therefore why not design commercial ranges with three cooking speeds: one a griddle, one for regular cooking, and another a high speed section, each automatic, and thus lift commercial cooking out of the competitive field. Food preservation, after it is cooked, by means of steam tables, likewise fails to take advantage of electricity's inherent control characteristics. Steam tables invariably maintain too high temperatures; meat needs high temperatures, vegetables and sauces lower. He suggested a dry food warmer providing separate areas of different temperatures, all automatically controlled. U. K. Petersen, Northwestern Electric Co., pointed to the danger of losing the lucrative glass coffee maker business to competitive fuels because of neglect. Each pound of coffee consumes 2.35 kw.-hr. and runs 51 cups to the pound, or 46 watt-hr. per cup.

J. C. Munro, B. C. Electric Railway Co., chairman Industrial Power Committee, introduced J. D. Scott, Portland General Electric Co., who told how tin goes in a can factory and around and around and comes out in dozens of completed tin cans per second, thanks to the precision control of electricity. He suggested that more of the heating load of can factories might be won to electricity. W. H. McMurray, Pacific Power & Light Co., waxed warm on the real opportunity to out-sell diesel competition on the strict basis of quality of service. He pointed out that diesel publications admitted municipal fields had been over-estimated as potentials for the sale of diesels, but that they were actively after the industrial business. A long list of points favorable to electric power as against engine power was given by him. Chairman Munro himself pointed to the need for a balanced power sales organization, requiring specialization on new business and routine development of prospects, personal contacts and service and a cooperation with other promotional activities of the company.

For the Air Conditioning Committee, A. K. Gaylord again sprang a novel idea or two. Advocating first that ventilation not be neglected just to sell fewer complete air conditioning jobs, he pointed to the large field of possibilities in ventilation alone. A new theory of pumping the air in against a static pressure, which keeps cold air

Candid views (left to right) of Presider Bill Mainwaring, Association President Kinsey Robinson, Keynoter Frank Post, Agriculturalist F. E. Price, Dealer Advocate J. R. MacKinnon, Water Heater Emissary A. H. Jaeger, Stormy Petrel Glenn Jackson. At extreme right, back of table are Mainwaring and Residential Sales J. A. Lockhart

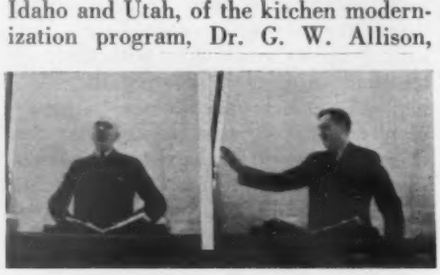
from infiltrating, prevents drafts and forces air in from the top down to the floor was described by him. Likewise a form of commercial kitchen ventilation taking the air off almost at the stove level and drawing it outdoors.

That same day both the Advertising Committee and the Lighting Committee held separate meetings of their own. At the Ad group, headed by James Lightbody, B. C. Electric Railway Co., M. L. Cummings, Utah Power & Light Co., presented the question "Institutional or Promotional Advertising?" Other subjects discussed included presentation of news to newspapers, radio advertising, production costs and methods, the latter by Raymond P. Kelley, Sievers-Kelley agency, Spokane; and Better Light-Better Sight advertising by Kenneth Striker, McCann Erickson, Portland.

Presided over by Walter Potter, Residential Lighting Committee chairman, the lighting group held informal but complete and sometimes very frank discussions of comparative sales programs and plans for the promotion and sale of home lighting equipment. Nobody's mind was changed or program altered, but many new ideas were exchanged and absorbed.

Realistic experience in selling minimum bill customers has resulted in classifying them as to (1) economic status and (2) using competitive fuels, said Glenn Jackson, chairman of the Minimum-Bill-Customer Committee, reporting under the Residential Sales Bureau, of which J. A. Lockhart, Pacific Power & Light Co., is chairman. Where customers were using their own maximum, little could be done, but where consumption was low because of lack of appreciation of electrical benefits, lamps, small appliances, lift-top refrigerators, radio, and electric clocks, all served to build these customers into larger users. Those using competitive fuels could often be sold more lighting and casseroles or roasters. W. A. Cyr, ELECTRICAL WEST, speaking on dealer cooperation, said that not the system but the sincerity determined the results. In selling, a salesman must get the customers point of view, he said, and in selling cooperation it was necessary to get the dealers point of view. James Lightbody, chairman, Advertising Committee, gave quite a few pertinent hints as to what sales managers should know about advertising, urged three to five year non-cancellable advertising appropriations and the merchandising of the company's own advertising to its sales staff and employees.

Introduced by Lewis A. Lewis, sponsor for eastern Washington, Montana, Idaho and Utah, of the kitchen modernization program, Dr. G. W. Allison,



Kitcheneers Lewis and Dr. Allison

Edison Electric Institute, described the kitchen modernization program, illustrating how it involved every interest in the community because of the broadness of the modernization need. Kitchen plans, results already obtained in other activities, advertising programs and local tie-ins, he also described. Tom D. Fulford, Puget Sound Power & Light, J. F. McAllister, Utah Power & Light, A. C. McMicken, sponsor for Oregon and western Washington, Portland General Electric Co., each told of plans in their territories already under way were coordinating with the national program.

J. R. MacKinnon, Ebasco Service Inc., threw several bombshells into the meeting by asking utilities to realize they were not working for the manufacturers, but for their customers, hence their goal should be service and not merchandise. He also declared that most utilities had not been recognizing nor using their largest potential outlets, the dealers who represented far greater sales volume than the utility alone.

Afternoon and evening Friday were devoted to water heating—the afternoon to the technical and engineering aspects of the different types of water heating promoted by the various companies, and the evening to the sales possibilities and programs. Tom D. Fulford presided. J. F. McAllister laid down the history of water heating in the Northwest as a beginning. George Quinan, Puget Sound Power & Light Co., analyzed range and water heater load characteristics, demonstrated by charts how the 3 hour range peak with its .7 of 1 per cent load factor could be nicely balanced with a 30 per cent saturation of off-peak water heating. Interesting studies of water draw-off indicates that Monday is the universal wash-day; Sunday the universal bath day and Friday the dullest day in the week as far as hot water is concerned.

S. B. Clark, Northwestern Electric Co., pointed to the difficulties inherent in differences in rates from 1½c to 7.5 mills, with different periods of time off and of complicated timing and metering mechanism which complicates the simplicity being sought in the sequence metering service entrance. He suggested plant and service betterment, rather than further development of such extra equipment, in order to provide the customer what he will ultimately demand; namely, unlimited service. G. S. Dawson, B. C. Electric Railway Co., outlined the company's analysis made of each customer's habits and uses of hot water in the preparation of estimates for the sale of satisfactory installations. An interesting point was that all installations are made by the Vancouver Electrical Association, contractors group, which maintains its own dispatcher's office, does all jobs at a flat price, allocates the work. C. S. Alger, Puget Sound Power & Light Co., analyzed possibilities of selling summer water heating to hotels, apartments, schools, touring camps and for car washing service. A thorough analysis of each situation was recommended.

Orr Crites, Portland General Electric Co., graphically opened the evening session with a sample sales talk using a large illustrated chart. In turn then J. W. Crowe, Idaho Power Co., Boise; A. C. McMicken, Portland General Electric Co.; A. H. Wegner, the Washington Water Power Co.; F. E. Ross, Puget Sound Power & Light Co.; Glenn Jackson, the California Oregon Power Co.;

Guy E. Davis, Pacific Power & Light Co.; John C. Plankinton, Northwestern Electric Co.; J. F. McAllister, Utah Power & Light Co., and W. C. Mainwaring, briefly sketched in outline their 1935 sales methods in the sale of water heating. Mr. Ross took occasion to answer dealers' cooperative intimations of the morning session and to urge getting away from the sale of technicalities. He said, "we haven't stumbled on to the big story yet. Water heaters have big advantages and should sell in greater volume than ranges."

Glenn Jackson also took off the gloves and gave a realistic account of the problems of endeavoring to get small dealers in scattered small communities to sell heavy duty appliances. Finally he said, by frank facing of the facts with the dealers, offering to take heavy duty appliances off their hands and throwing them more business in other lines, his companies have been doing a good load building job on these major appliances.

A. H. Jaeger, manager, Water Heater Division, Edison General Electric Appliance Co., Chicago, described various national aspects of water heating, told of recent trends in styling and rates as well as increase in double-unit applications.

Saturday morning, an innovation in commercial section conclaves, gave lighting its inning. J. C. Plankinton laid the foundation for a successful meeting. He pointed out that even the criticisms of the activities of power companies in promoting lighting were a good indication of the public interest. In a resume of 1935 results and sales methods, G. B. Bocarde, Pacific Power & Light Co., totalled the lighting load in commercial and industrial lighting as an equivalent of 16,500 ranges at $35.00 per range annual revenue. R. Hall, B. C. Electric Railway Co., set up the question as to the economic soundness of selling some customers of low usage and more light capacity than they would use or could pay for. More emphasis at the base of the problem, wiring, had been his company's policy.

T. W. Fitch, Portland General Electric Co., spoke of special projects for 1936 in school, street and highway lighting. He pointed out that test with photocells in schools showed that fully 50 per cent of the time artificial lighting is needed in order to maintain an average of 15 ft. candles in a class room. For highway lighting he told of the need for sample installations to demonstrate visually to the public the results of good highway lighting.

George M. Boyd, Westinghouse Electric & Manufacturing Co., dramatically and forcefully urged a vital appreciation of the "magnificence" of the industry, suggested continued activity rather than feverish campaign spurts, and the adoption of the "go-giving" attitude rather than a "go-getting" one. He pointed to the inter-relation of all factors, electrical and otherwise, in a good lighting installation. He pled for appreciation of all parties' contributions and an effort to win cooperation.

Home lighting closed the show with what Chairman Walter E. Potter of the Residential Lighting Committee aptly termed "feminine pulchritude," for it was in this part of the program that home service lighting girls, brought together for the first time at this conference, presented their part of the show, a skit written by Harriett Klumpp and acted by the girls. The first scene, in a department store, illustrated the indifference to the sale of good lighting equipment where the utility had not coordinated the Better Light—Better Sight movement with the local outlets for lighting equipment. The second scene showed the reverse, where a fine cooperative program between the utility and the store had been developed by the work of the home lighting girls.

Claiming better results from a specialized lighting program, C. T. Bakeman, Puget Sound Power & Light Co., made an analysis to evaluate home lighting activities. In his company alone the home lighting activity this year had developed load the equivalent of 16,000 electric ranges, based on $35.00 annual revenue per range.

Association President, Kinsey M. Robinson, closed the convention shortly after noon Saturday by repeating the need for more revenue, pointing to the new attitude of all chief executives toward sales activities, and urging those who had attended the meeting to pass on the information they had gained to those less fortunate who had had to remain at home.

Kitchen Modernization Plan Officially Launched

FIRST refrigerators, then ranges, and now complete electric kitchens! Thus has the national cooperative activity progressed, step by step, toward the new national program for kitchen modernization. With the distribution of 20,000 plan books, George E. Whitwell, national chairman, has officially started the movement. Five assets are listed for the program.

1. It is centered about home betterment with practical public benefits in home comfort, labor saving and bettered health.
2. An opportunity for practical cooperation within the electrical industry over a greater, broader field.
3. Profit and new employment for manufacturers, distributors, retailers and contractors.
4. New load for utility companies and bettered public acceptance of the electrification of the home.
5. Definite new business benefit to other than the electrical industry, including floor coverings, paint, hardware, plumbing, kitchen furnishings and utensils, finance companies, architects, building contractors and others.

Not only will the complete remodeling of a kitchen be fostered but also a program of easy step-by-step purchase of the various required items of electrical equipment for the eventual modernization of the kitchen will be promoted.

The modernization bureau is sponsored by Edison Electric Institute and National Electrical Manufacturers Assn. Using E.E.I. as headquarters, R. E. Barnes has been made manager of the activity. Regional directors have been

Hollywood stars have been drafted to sell the modern electric kitchen idea in the talkie, "The Courage of Kay" available through E.E.I. on a rental basis for local showings

appointed in the eleven Western states as follows: G. B. Buck, Public Service Co. of Colorado, Denver—Wyoming, Colorado and New Mexico; R. E. Fisher, Pacific Gas and Electric Co., San Francisco—California, Nevada and Arizona; Lewis A. Lewis, Washington Water Power Co., Spokane—eastern Washington, Idaho, Utah and Montana; and A. C. McMicken, Portland General Electric Co., Portland—Oregon and western Washington. Field representatives will assist in local organization work.

It is contemplated that local bureaus will be formed similar to the refrigeration bureau and cookery council of the past. Suggested plans for the formation of such bureaus are to be contained in the plan book. No national advertising by the bureau is contemplated, although all of the manufacturers who are supporting the idea have promised to devote part of their national advertising to the promotion of the general kitchen modernization idea.

Utmost flexibility of operations in local bureaus is provided with membership to be decided in each locality. It is suggested that model electric kitchens, a kitchen planning service, special promotions, local publicity and promotional activities be used.

Collections of kitchen plans, suggested newspaper copy, a publicity service sent to the local bureaus for placing in their own local newspapers, standard window and counter displays, radio continuities, electrical transcriptions, illustrated talks and addresses, a standard bureau emblem and slogan and utility contests are also suggested in the plan book.

Already a talking moving picture, 40 min. in length and called "The Courage of Kay," has been prepared under the sponsorship of the E.E.I., McCall's Magazine, a selected industrial group cooperating with the Federal Housing Administration and electrical manufacturers and is available on rental or purchase for local showings. Cast with Hollywood stars and employing a human interest story to show the contrast between the labor-wasting kitchens of the past and the modernized kitchen of today and tomorrow, the picture already has been booked by a number of utilities, among them the Idaho Power Co., Portland General Electric Co. and others.

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• LIPMAN WOLFE & Co., Portland department store, plans to add an electric kitchen to its major electric appliance department in 1936, according to Bob Ashby, manager of the department. Sales in 1935 in most lines doubled those of 1934 and have more than justified the additional.

Puppets Used to Tell P. G. and E. Sales Story

By E. W. KIMMELL

Dealer Sales Promotion, East Bay Division, Pacific Gas and Electric Company

Unique presentation of its sales promotional program for 1936 was given in the form of a puppet show by the East Bay Division of the Pacific Gas and Electric Co. Stage setting and puppets are shown above

EAST BAY Division of the Pacific Gas and Electric Co. and L. F. Galbraith, division manager, employed a most unique presentation for telling of the company's sales promotion program for 1936, to groups of dealers and employees in Concord, Hayward, Berkeley and Oakland, on Jan. 27, 28, 30 and 31, respectively.

The stage setting showed a large book, on the title page of which was "Gas and Electricity—The Best Sellers for 1936." These pages were 4 by 5 ft., 14 in number and formed a background for the puppet stage.

The master of ceremonies, a puppet in evening dress, at the opening of the show introduced one by one members of the cast, consisting of Mrs. Annie Customer, a housewife; Mr. Hunter, the P. G. & E. sales service representative; Ray Haberdasher, proprietor of the haberdashery store; Mr. Graham Indus- and Kilowatt, the dog.

Following an opening statement by the master of ceremonies the audience viewed various statistical charts and sales information relative to the recently inaugurated reduced electric rates. Highlights on the customer interest in appliances revealed by a sales service survey; the dealer appliance job accomplished in 1936; the market analysis for dealers and company in 1936 and the cooperative selling program of the company utilizing advertising, prospects, campaigns and dealer organizations were also shown in chart form as the puppet leader talked.

Electrical home appliances were beautifully displayed on each side of the puppet stage and pointed out by the puppets as their part in the story developed. Between the acts a quaint touch was added by the tinkle of an old fashioned music box.

No living person appeared at any time during the complete performance. The puppet who acted as master of ceremonies gave the welcoming address and introduced the serious part of the program and turned the pages of the book. Bits of humor were effectively added. At the conclusion of the performance the master of ceremonies announced to the audience that light refreshments would be served and thanked them for their attendance.

Mr. Perry Dilley, who heads one of the three schools of puppetry in the United States, at the University of California, operated the show. The idea was developed and the script written by members of the sales department of the East Bay division.

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• HALE BROS., San Francisco, borrowed two electric meters from the Pacific Gas and Electric Co. for a unique display in its appliance sales room to compare the operating costs of an electric refrigerator with that of a 60-watt lamp. They also used a large cost indicator rate wheel which has been developed for demonstrating the saving to consumers resulting from the recent rate reductions of that utility.

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• S. J. MCCORMICK Co., of Portland, Ore., has recently enlarged quarters, taking over the basement of its premises and remodeling this basement into a smart display room for electrical appliances. An electric kitchen is being installed also.

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ELECTRICAL WEST COOPERATIVE

SALES APPLIANCE ★ GUIDE

REFRIGERATORS

APRIL, 1936

. . . . Copyright, 1936, by Electrical West, 883 Mission St., San Francisco

Convert More Prospects into Buyers

Check Yourself Against These Hints for Successful Sales

Seasons—

Although the idea of seasons for an electric refrigerator is mostly in the mind (both of the prospect and of the salesman), as long as that is true, make use of it. Display so as to tie-in with the seasons: In spring suggest by light colors, flowers, and manufacturer helps, the spring idea—but put a card in to tell about fresh spring vegetables. In summer suggest cool drinks and desserts. Make your display "feel cool" with greens and blues, fans blowing a breeze, etc. In the fall suggest the harvest season—and good things to eat, the refrigerator always full of them. In winter show that it is still summer in the kitchen, and foods must be kept cold—also that weather has its ups and downs, and can't be depended upon to do the refrigeration safely.

Prospects—

To find prospects may take a little study and analysis, but it is worth the effort. *Store traffic,* of course is the best source. But *users* are probably the richest source of new prospects. It flatters a former customer to see you are still interested in her, so call and ask how everything is going with her refrigerator, bring some new recipes, or some hint for improving her use of it. Then set her to thinking as to whom among her acquaintances has a refrigerator that is worn out, or too small, or who may have just been married or moved to town. *Other ways* to get prospects include that good old "cold turkey" canvass. It still discovers many prospects that all the other salesmen have missed.

Sales Talk—

Every salesman meets certain resistances to his selling. In every case they will not be the same. But inside, Bill Smith, master salesman, handles a few tough ones that are common to most sales in a way which may help you put over your next sale. Notice how he keeps leading back into his selling points tactfully. By the way, the main selling points of any and all refrigerators are listed on the back page of this Guide.

What Refrigerator Sales Mean—

To the Dealer—

A good profit from a relatively large unit sale.

Quicker turnover because of popular demand and acceptance.

Satisfied customers who can later be followed up for the sale of other appliances.

Service at a minimum, both because the new machines have had all the "bugs" taken out of them, are simpler and more reliable, and most of them carry long service guarantees in the form of insurance, which protects the dealer.

More promotion and advertising on refrigerators than on most any appliance, which means less sales resistance and more created demand.

Business builder, both in profits and prestige for the firm. Refrigerators give such tangible service to the user that they create goodwill for the dealer.

To the Salesman—

Better commission from large unit sale.

Sales easier to make because of general acceptance and popularity of electric refrigerators.

More prospects from satisfied customers who recommend to friends.

Better chance to make name for yourself by doing a good volume and producing a better income.

Satisfaction of selling a device that will prove worth more to the buyer than any price asked.

SALES TALKS THAT

CASE HISTORY NO. 16

SEASONS come and go, but Bill Smith, master salesman, keeps on his toes ready to sell a refrigerator any time. Nevertheless, he is wise enough to take advantage of every opportunity to convert timeliness to make more sales. A refrigerator, he knows, is all-season merchandise, and the advantages it brings to his customers are as real in spring as in winter or fall. He always keeps a nice display of a few representative models, but he is alert to use any special campaign or activity to help interest more people; whet their appetites to buy. In spring he ties in with his manufacturer's or his local bureau's seasonal campaign. It is the appeal of fresh vegetables and foodstuffs that comes with spring. In summer the cold cookery idea is what appeals. In the fall he links the good points of refrigeration to the harvest season—Hallowe'en and Thanksgiving; in winter to safeguarding health by food preservation, and to present as a gift. But whatever the season, Bill is smart enough to know that he will get more refrigerator profits and sales for himself if he sells from the customer's viewpoint, stressing most what his refrigerator will do for the purchaser. His window display, neat, attractive, has just brought Mrs. Carr into his store "just looking."

★ ★ ★

BILL: "That vegetable crisper tray you were just looking at certainly keeps lettuce crisp and fresh, even for days. And the nice thing is you can save money by buying several heads of lettuce at a time. You always know that they will keep so well until you are ready to use them."

MRS. CARR: "That's what I've heard. You see, I was just looking. I don't know that we could have one just yet."

IN this remark Bill can detect several things. First, that she is really more anxious to have a refrigerator than she wants to let on. Next that she may have shopped around and has heard several competitive stories. And it is more than likely that fear of cost will be her defence against buying. Bill realized long ago that every good refrigerator this year has about an equal complement of gadgets and features. He also knows from experience that while these all help to sell, the refrigerators that stay sold best are those which he has sold on downright usefulness to his customer.

BILL: *(Allowing her to try the door, the trays, the various features herself, as he explains each in turn)* "This new type freezing compartment looks smart, doesn't it? But its real purpose is to make ice creams, or freeze ice cubes faster. See also how conveniently the shelves are arranged to get at all of the good things you will store in it, absolutely sure of their safety and goodness. That's how so many of my customers have saved enough to more than pay for their refrigerators."

MRS. CARR: "Well, maybe some women might, but I don't know. I just can't see how a person could have so much without a lot of thinking and planning ahead, and I just don't have the time."

LONG ago Bill learned that often to sell a labor-saving device it is necessary to sell a new way of living, because some people cling to their habits and fear change. So he paints a picture of what that change will mean in improved living. But first he must not antagonize her by belittling her way of doing her housekeeping.

BILL: "I know just how you feel, and really it may seem like a bit of worry was required, but many of my customers tell me they unconsciously make these savings, without giving them more than a passing thought. You feel so safe about the ability to keep foods fresh and appetizing in this refrigerator, that when you see something you like, you get a larger quantity, if there is a saving by buying a little more. And it keeps. You can always be sure of that. Then there is another way it saves, too. My wife, when she gets ready to cook some potatoes or other vegetables, often says to herself, "Might as well cook up a few more, and then there'll be some tomorrow for a salad.' And the nice thing is, that even if she has to leave it for several days—you know how it is—you may decide to go out to dinner the next day, or something changes your plans—you can find it here in the refrigerator, safe and appetizing whenever you do get around to using it. Just saves it from the garbage pail, and

Sold APPLIANCES

SELLING AN ELECTRIC REFIGERATOR

you hardly realize that you have saved real money along with the food."

MRS. CARR: "I see, but still, while I'd like one, I'm not sure that we could afford one right now. They are nice, and I just thought I'd look around a bit. Thank you, for your trouble."

RIGHT here is a crucial moment. Many salesmen would simply bow themselves away with a "Not at all, it has been a pleasure," and dismiss Mrs. Carr as just a "suspect". But Bill realizes that she is more interested than she will admit, so concentrates all of his selling points in his answer with the feeling that it may reopen his chance to sell, or at least send her away with plenty to think about to sharpen her desire for the refrigerator and bring her back. He is really sincere when he says to her—

BILL: "It is never a bit of trouble to show you how your work will be made easier, how you will get pleasure, and delicious tasting meals, and the peace of mind that comes with knowing that all your food is safe and clean and good to eat. And to think that you have all of these while you are actually saving—unconsciously and without planning it necessarily—that the refrigerator actually pays for itself in this way. I always feel that it is an opportunity to make your electric service a real servant to you. From what you have told me I am sure that you are going to have one some day. What I'd like to do would be to let you have this attractive, so easy to clean and so handy and useful refrigerator servant much sooner, so that you can begin right away to enjoy using it. Have I told you of our budget terms that just about convert the savings I told you of into the payments to buy the refrigerator? Won't you sit down here a moment and let us see if we can't arrange things so that you can begin to have and enjoy this model—why I think I could get it into your own kitchen tomorrow morning."

MRS. CARR: "Well, while I'd like it, I'm afraid we couldn't afford it anyway."

BILL: *(pleasantly)* "I know, but let's just figure it out for a moment and it may surprise us. I know that it has surprised many of my customers to find how little it really takes to begin making it pay them right back more than they invest in food savings, real marketing savings, and savings in the desserts and dainties that you can prepare from it—to say nothing of the big dividends they get every day, every minute, in just plain satisfaction and peace of mind. That's worth a great deal, isn't it? Now, let's see—"

BILL analyzes the financing quickly and shows her the way he arrives at his figures so that she will be satisfied with every detail. Most financing plans provide the way to show the customer such important details. There is some more discussion of these details, all of which Bill quickly converts into advantages to be gained by buying right away. Then, convinced that his proposition is genuinely beneficial to his prospect, Bill moves on to close the sale.

BILL: "Suppose then, that I have our man bring it over and install it tomorrow morning? You can easily prove to your husband what a fine cook you are, and what a wonderful helper you will both have in the kitchen to make your meals tastier, your expenses less, and your losses from wasted food almost nothing. Why you'll have time to put in one of those delicious, easily prepared ice creams or frozen desserts in time to serve it for dinner. Will tomorrow morning be all right?"

MRS. CARR: "I don't know—I certainly would like to, but I don't like to make such a decision without consulting my husband."

THIS is a familiar situation. Right at the point of sale, the decision is delayed and passed on to someone else. This calls for use of good sense and patience. It may mean a call at the home to sell the husband as well, or a call there to sell him the idea of coming down to the store for a demonstration. Bill is ready for either eventuality, but, without loss of patience or without seeming insistent, he decides to try again to close, for it may be that Mrs. Carr is fully capable of making the decision herself, and only needs further selling.

BILL: "Yes, indeed, Mrs. Carr. I can appreciate that thoughtfulness, and I'm sure Mr. Carr does too. You will want to talk over with him how attractive it will make the kitchen, what pride he will take in it too, and doubtless he will want to use it for iced beverages and things of that kind. *(Since some people still object to liquor, see how Bill has avoided what might be a real pitfall.)* If he likes fishing, you can tell him that he can keep his catch on ice and even for several days in cold storage. I'm sure he'd appreciate that. In fact, I wonder if he wouldn't be real proud of you—of course he might not admit it at first—if you just went ahead and had it delivered. After all, he leaves the selection of home furnishings and equipment pretty much to your capable judgment, I would say. And as long as you are sure that it will pay for itself, that it will help you in so many ways with your meals, make delicious desserts, save food and protect your health, you can feel sure that it will sell itself to him just as it has to you. Why not make a surprise dinner tomorrow evening?"

IF she still objected, the way was still open for him to make an appointment for an evening call to talk it over with her husband. In that case Bill knew that he could have an ally, for he had armed her with all of the good things the refrigerator would do for her home so that she could help sell him. She had pictures in her mind of how it would look in her kitchen, and of what she could do with it. In this case, though, Bill had judged correctly, for after a moment's reflection, Mrs. Carr smiled with the assurance that she knew she could convince her husband, come what may, and she said—

MRS. CARR: "I think I shall. You are sure you can have it delivered in the morning, now?"

CALIFORNIA OREGON POWER CO. • PORTLAND GENERAL ELECTRIC CO.
MOUNTAIN STATES POWER CO. • PUGET SOUND POWER & LIGHT CO.
PACIFIC POWER & LIGHT CO. • IDAHO POWER CO.
NORTHWESTERN ELECTRIC CO. • WASHINGTON WATER POWER CO.
UTAH POWER & LIGHT CO.

Clever use of manufacturers' display material was made by this Portland department store in displaying a whole block of refrigerator and appliance windows, the refrigerator in each case taking center stage. Left to right: Frigidaire "Metermiser" and other sales points above the unit; Westinghouse's golden jubilee model display; General Electric's "living electrically" piece; Kelvinator "big news" display; and Norge's "you can't tell a book from its cover"—all emphasizing extra value and economy

These Points Overcome Sales Resistance

and hasten the sale along

Protects Health

By keeping foods at temperatures below 50 degrees, bacterial growth is stopped or retarded. Foods keep sweet and healthful, even for long periods.

Saves Food

By stopping spoilage many savings can be made, even without thought or attention. Leftovers are kept and can be used in many ways. (See recipe books.) Extra quantities can be cooked at one time and fuel and time saved in preparation of salads, or children's lunches later.

Pays For Itself

Not only in food saved, but in the ability to store quantity purchases. Where specials are offered the purchaser can avail herself of these low prices and feel sure that what she buys will keep until she can use it. Whole week's marketing can be done at once, which saves time; in some cases saves the necessity to face traffic worries and to be safer than out marketing.

Saves Time

In food preparation especially. By keeping the refrigerator well stocked it only takes a minute to make a salad, a pick-up lunch, the children's lunches for school. When mother is ill, the family can get along better in preparing meals—thus relieving her of worry and hastening recovery.

Saves Electric Costs

All new models have increased efficiency which makes for more economical operation. In addition, a refrigerator helps get down on lower steps of the rate, and makes the use of other electrical labor saving devices more economical too.

So Convenient

With all foodstuffs kept in one central place, a refrigerator saves steps. It is handy for all sorts of cooling services—chilling jello quickly for dessert, providing ice for the table, or for illness, or for entertainment. Makes a number of delicious frozen desserts. Several kinds of prepared ice cream hastens this method and produces excellent results.

Entertaining—Hostesship

Makes it easy to entertain graciously. For a large group dainties can be prepared in advance, kept perfectly until served, allowing the hostess to be with her guests instead of out in the kitchen. For a couple who drop in for bridge, there is always something in the refrigerator to serve before they depart.

Clean

Both in looks and in fact. New finishes and fittings are easy to wipe clean quickly. Clean appearance given to the kitchen by the gleaming white refrigerator. Foods are kept clean, with no chance to spill or be messed up, or be found and contaminated by insects.

Beautiful Appearance

Modern styling, beautiful finishes, make it an asset to the looks of any home.

Portable

An electric refrigerator is truly portable. It can be moved anywhere, either to rearrange the kitchen, or to a new house, without need for trouble or bother, without piping, or supply of fuel. All one has to do is to plug it in, and it is in operation.

Prepares Better Food

Both in taste and appearance food is improved by use of the electric refrigerator. Salads look and are crisper from well kept vegetables. They are more appetizing in appearance. Steaks can be made tender by keeping them.

Replaces Servants

By cutting down on time to do kitchen tasks, it helps to make servants unnecessary, and thus removes all the bother and concern they cause and does not make one dependent on them. Cannot carry home troubles out to the neighbors, quit the job just at a crucial moment, needs no day off, or any nights out. Does not talk back or become stubborn. Does its job the same way every day without complaining.

Pride

There is real pride in being modern, in using modern equipment in the home. Pride, too, in the fine appearance of the modern refrigerator.

A Unit of the All-Electric Kitchen

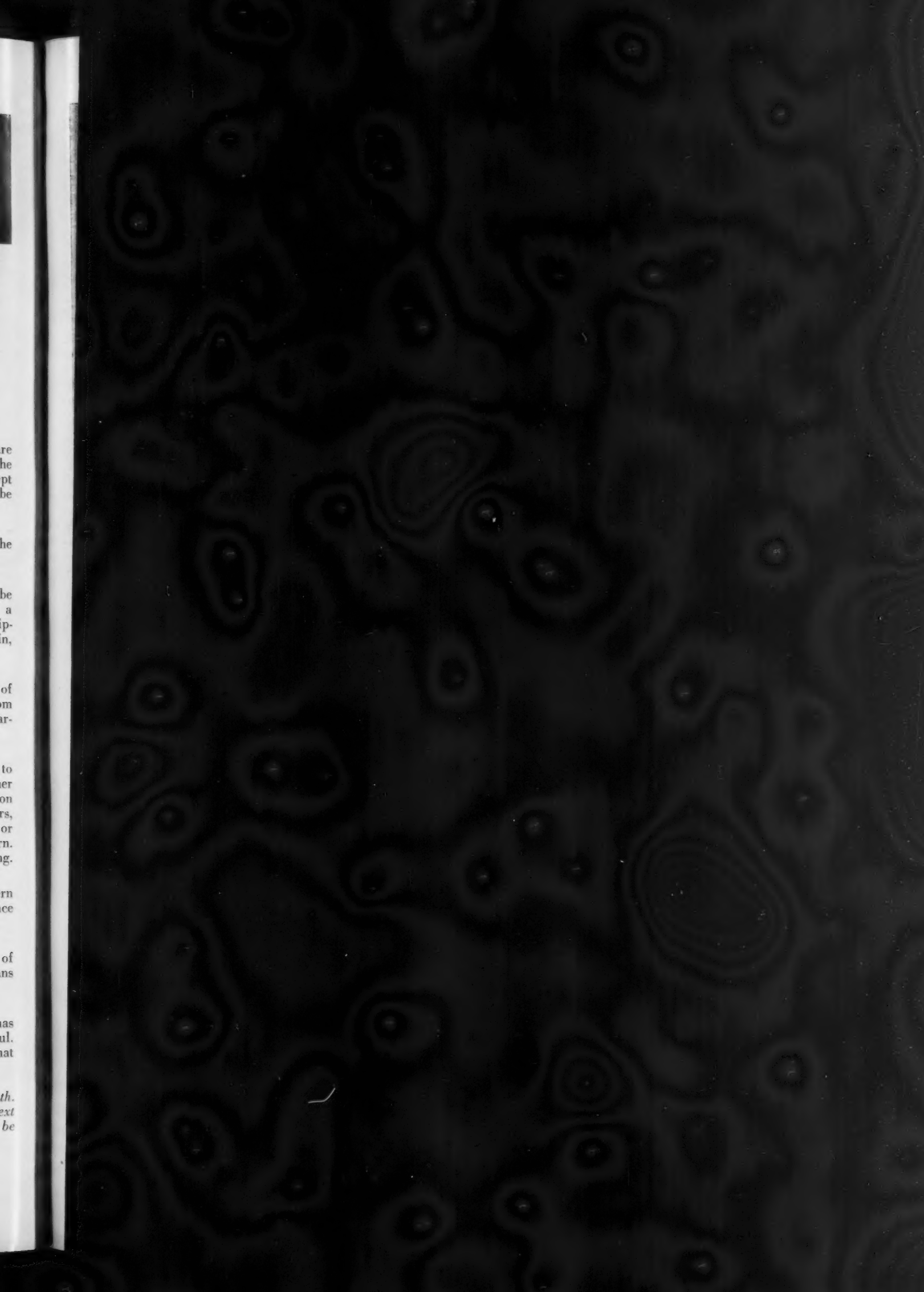
The refrigerator is one of the most important units of the all-electric kitchen. It will fit into any future plans for the whole kitchen remodeling.

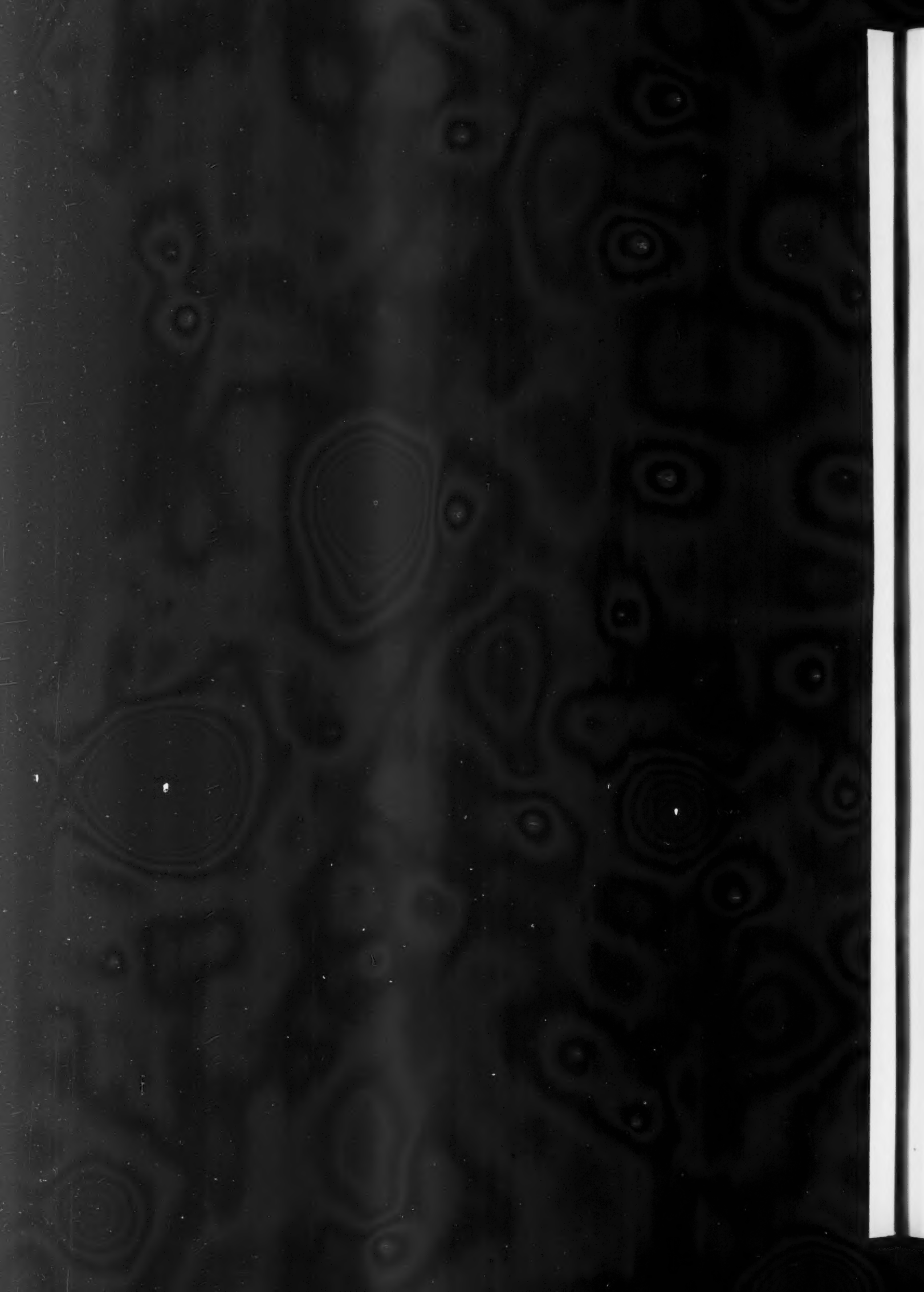
Gadgets

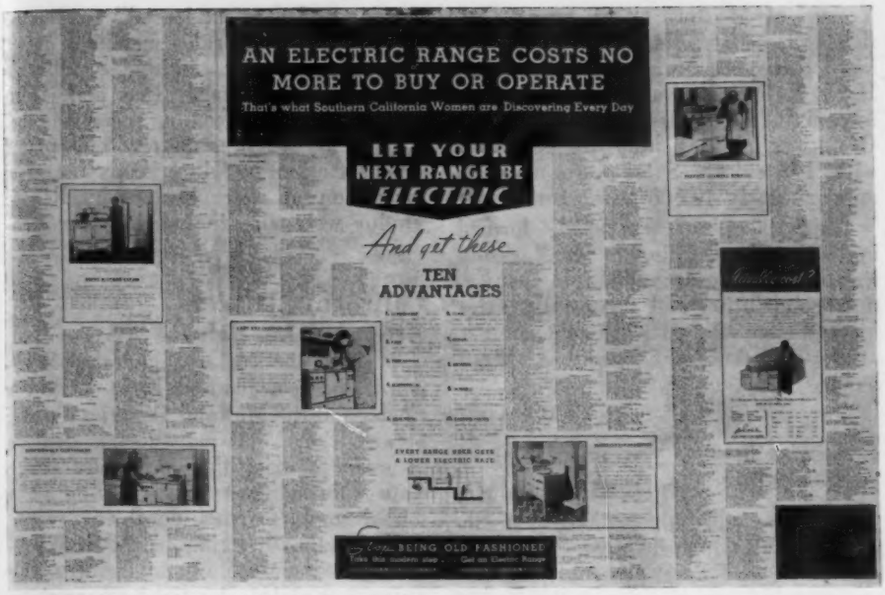
Convert every feature that your make of refrigerator has into *what it will do* to make it more convenient or useful. It is not the gadget itself, but what *service it performs* that is important to the buyer.

●

Sales Guides now appear in these columns each month. Clip them out and save them in a folder or file. Next month Water Heaters will be analysed so that you will be better prepared for selling them.






AN ELECTRIC RANGE COSTS NO MORE TO BUY OR OPERATE
That's what Southern California Women are Discovering Every Day
LET YOUR NEXT RANGE BE ELECTRIC
And get these
TEN ADVANTAGES

Inside spread of dealer broadside containing several thousand range user names and several testimonials to the advantages of electric cookery

Users Listed in Range Campaign Broadside

IMPRESSIVE, because of the tremendous volume of names contained, is a range broadside being furnished dealers at the mere cost of postage by the Southern California Edison Co. Ltd. as a part of the electric range campaign which began at the first of the year. Dealers are sending these broadsides to their own mailing lists.

A supply of the broadsides has been placed in the hands of each of the Edison company dealer representatives who leave one or two with a dealer as a sample. The dealer then places an order for the quantity to be used. The dealer representative gets a supply and affixes the stamps before he turns them over to the dealer who does his own addressing and mailing.

The broadside contains some very effective sales messages. Its cover declares "150 women are changing to electric cookery every week in Edison territory alone." Upon opening is found the message that the folder contains a partial list of 30,000 women cooking on electric ranges every day. The long list of names of people in each of the communities served is broken up by attractive boxes which give a personal testimonial, illustrated by a picture of one of the customers with her range. Each of these testimonials has been selected because it brings out one of the sales features of electric cooking. The inside spread, which is illustrated herewith, lists the ten advantages: dependability, fastness, time saving, economy, healthfulness, coolness, cleanliness, modernity, durability and tastier foods. The various pictures also illustrate each of the different makes of ranges sold in these territories.

A copy of the new wiring and trade-in allowance policy of the company was sent to every dealer by H. C. Rice, merchandise manager, with the new folder. Mr. Rice says, "The only major change is that instead of having separate certificates and allowances for range and water heater wiring for new homes, we now have but one certificate and only make a wiring allowance for a new home where both range and water heater wiring is installed. This change places greater emphasis on the all-electric kitchen instead of individual pieces of merchandise. This also ties in perfectly with our advertising program for the year 1936 which will feature the all-electric kitchen and the step by step story of how it can be obtained, and featuring the items being campaigned."

●

Revamped coach of the Idaho Power Co. which is now fitted to hold many small cooking schools in rural territories

Bureau Puts "Electric Kitchen on the Air"

The "Electric Kitchen on the Air" is the title of a new program being sponsored by the Los Angeles Bureau of Power and Light. Featuring its home economists, Ann Martin and Agnes White the broadcasts were begun in November and are continuing for a period of thirteen weeks. The program originates in the studios of KFI every Tuesday and Thursday from 1:30 to 2 p.m.

Benefits to be enjoyed by the housewife from an all-electric kitchen are made the theme of the talks given by the home economists.

Publicity for the new program has been widely given through a series of newspaper announcements. A tie-in for dealers provides a display rack which is used to dispense periodic recipe bulletins and promotional bulletins and booklets. These bulletins are supplied each dealer without charge twice each month.

●

Coach to Give Small Cooking Schools in Idaho

Smaller and more personal cooking schools will be the order, this year in Idaho, in the cooperative work between dealers and Idaho Power Co. The latter's kitchen coach has been completely refitted inside to form a convenient means for holding a small cooking school for from eight to ten women.

Last year the coach was used to demonstrate the electric kitchen idea in cooperation with dealers throughout the Idaho Power Co.'s territory.

This year it is planned that the company and dealers will take the coach out into a neighborhood, particularly in the rural areas, and hold a cooking demonstration and school for a small group of women who are dealer prospects. Appointments will be made by the dealers or the company and neighbors called in for the demonstration.

A better opportunity to answer questions regarding electric cooking and to explain at greater detail some of the features and benefits from this manner of cooking will be possible by this new technique.

●

Twenty-six Added to Copco Hundred Per Cent Club

The "100 Club" of the sales organization of The California Oregon Power Co., Medford, and Mountain States Power Co., Albany, Ore., took in 26 members during the course of 1935, according to Glenn L. Jackson, vice president in charge of sales for the two companies. The club is composed of salesmen selling 100 or more ranges, refrigerators and water heaters during the year. These 25 salesmen sold during the year 2059 ranges, 1146 refrigerators, 537 water heaters, or a total of 3,742 units. Twenty other members of the sales staff working the whole year, and a number of others a part of the year accounted for the balance of the sales of these three items, which in total for the two companies are listed as follows:

Ranges	3,060
Refrigerators	1,975
Water Heaters	706
Total	5,741

Four members of the club exceeded 200 units each. They are: H. A. Young, of Medford, 275; Frank Gordon, Klamath Falls, 231; John Graham, Kalispell, Mont., 211; and Fred Hartt, Kalispell, Mont., 207. The fifth in rank, C. M. Williams, of Marshfield, Ore., was close behind these leaders with 193 sales. Sales were made to approximately 40,000 customers.

The "100 Club" was newly formed in 1935 and according to Mr. Jackson, was a source of considerable inspiration, competition and fun for the sales force during the year. Each member of the club received a new suit as a bonus.

•

Edison Players "Stream Line" Sales Meeting

Imbued with the Shakespearean spirit of the Globe Theatre Players at the San Diego Fair, the merchandise department of the Southern California Edison Company under the direction of Henry E. Rice, merchandise manager, presented a tabloid sales meeting at the Dec. 16 meeting of the Los Angeles Electric Club. W. L. Frost, vice-president in charge of the commercial department, Southern California Edison Co., opened the "condensed" version of the "streamlined" sales meeting.

A teaser skit, entitled "Where's Elmer?" with Henry Rice and John Adams in the speaking roles was included in the presentation. A proof demonstration by H. J. Drexel and a discussion of water heaters by R. M. Taylor were also included in the program.

•

California Dealers Attend Sales School

Through the Dealer Cooperative Service of the San Joaquin Light & Power Corp., and the Midland Counties Public Service Corp., gas and electric dealers in every district the companies serve were afforded free sales training at a school conducted this month in Fresno.

Under the direction of S. F. Worswick, sales counsellor and lecturer, the group met nightly for two-hour sessions from March 30 to April 3. Intensive preparation for the school's opening, in which Mr. Worswick personally addressed dealers throughout the districts served, was supervised by the San Joaquin Light & Power Merchandising Division, directed by Frank A. Easton.

DEALER SALES REPORTS—FEBRUARY 1936

A Summary of Dealer Reports Compiled by Associations, Societies, or Bureaus, or Dealer Contact Departments of Utilities

APPLIANCE	P. G. & E. Co.[1]		San Diego Cons. G. & E. Co.[2]		San Joaquin Lt. & P. Corp.[3]		So. Calif. Edison Co., Ltd.[4]		Utah Power & Lt. Co.[5]		Wash. Water Power Co.[6]		Idaho Power Co.[7]	
	*Feb. 1936	Year to date	Feb. 1936	Year to date	Feb. 1936	Year to date	Feb. 1936	Year to date	Feb. 1936	Year to date	Feb. 1936	Year to date	Feb. 1936	Year to date
Ranges	235	494	.....	.....	120	259	540	962	151	244	.....	322	449	622
Water Heaters	165	341	.....	.....	60	146	277	498	34	38	.....	193	41	69
Air Heaters—aux.	965	3,174	.....	.....	2	70	190	512	310	457	.....	457	54	144
Air Heaters, 220	76	171	.....	.....	49	161	.....	.....	.....	.....	.....	.....	.....	.....
Refrigerators	1,884	3,947	.....	.....	357	529	2,114	3,758	350	557	.....	513	191	385
Dishwashers	18	80	.....	.....	.....	.....	.....	.....	5	23	.....	1	7	7
Washers	2,610	5,641	.....	.....	396	712	2,774	5,288	979	1,635	.....	763	486	1,127
Ironers	748	1,824	.....	.....	98	171	536	1,070	61	108	.....	130	85	199
Vac. Cleaners	1,832	4,181	.....	.....	83	145	1,000	1,920	469	968	.....	540	122	268
Radios	6,578	19,922	.....	.....	639	1,248	4,923	9,558	1,538	2,852	.....	2,205	678	1,644
Mixers	804	4,345	.....	.....	62	148	356	820	166	408	.....	313	70	192
Cookers, Casseroles	.....	.....	.....	.....	22	39	36	97	30	35	.....	356	3	14
Irons	.....	.....	.....	.....	332	618	1,454	2,806	863	1,667	.....	1,121	291	661
Waffle Irons	.....	.....	.....	.....	105	243	417	984	486	891	.....	454	133	328
Toasters	.....	.....	.....	.....	127	314	530	1,214	545	948	.....	1,126	256	591
Table Stoves, etc.	.....	.....	.....	.....	108	283	246	519	1,071	1,758	.....	106	90	146
Heating Pads	.....	.....	.....	.....	65	97	257	630	250	495	.....	333	57	148
Curling Irons	.....	.....	.....	.....	.....	.....	60	123	223	424	.....	.....	.....	.....
Coffee Makers	.....	.....	.....	.....	97	214	346	691	355	645	.....	778	87	265
Sewing Machines	1,283	2,692	.....	.....	.....	.....	.....	.....	87	174	.....	125	.....	.....
Clocks	.....	.....	.....	.....	89	209	413	928	223	556	.....	476	62	133
Fans	.....	.....	.....	.....	.....	.....	18	33	12	27	.....	28	13	27
Floor Polishers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sun Lamps	.....	.....	.....	.....	.....	.....	41	72	17	33	.....	29	16	22
Reflector Lamps	.....	.....	.....	.....	78	184	.....	.....	1,405	3,058	.....	.....	523	1,215
Misc. Lamps	.....	.....	.....	.....	.....	.....	.....	.....	1,261	2,315	.....	1,524	392	1,655
Yard Lights	.....	.....	.....	.....	47	80	.....	.....	.....	.....	.....	.....	62	127
Misc. Small Appl.	.....	.....	.....	.....	366	568	543	1,224	.....	.....	.....	.....	.....	.....
Total Dealers	1,400	.....	.....	.....	.....	.....	583	583	.....	.....	.....	.....	.....	.....
No. Reporting	.....	.....	.....	.....	138	129†	554	542†	.....	.....	.....	.....	.....	.....

[1] P. G. and E. reports obtained only on major appliances upon which accurate reports are available from dealers' accounts. Ranges, water heaters, and air heaters include company and dealer sales. Total dealers include gas as well as electric dealers. * Previous month's figures shown under current month's heading.

[2] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table. Clocks, fans included under miscellaneous.

[3] Includes dealer reports from Midland Counties Public Service Corp. territory also. Compiled by Valley Electrical Supply Co.

[4] Includes reports from dealers on San Joaquin Valley system of the company as well as Southern California areas served.

[5] Includes Utah Power & Light Co. territory in Utah, Idaho and Wyoming. Also Western Colorado Power Co. territory.

[6] Dealer sales only for Spokane and company's territory. Company sales not included. Table stoves, grills included with cookers.

[7] Figures compiled by Electrical Equipment Sales Association. Include power company sales and sales of all reporting dealers—about 60% report.

† Arithmetical average of number of dealers reporting.

Air Conditioning Symposium + + +

A Market That Beckons With Profits and Load

SINCE time immemorial man has talked about the weather. Now the electrical industry can and proposes to do something about it despite the remarks attributed to Mark Twain. Air conditioning has come out of the laboratory and is ready for homes, stores, offices, factories and commercial establishments. A study of the facts reveals that air conditioning is not something which will materialize in the far-off future, but that it is a businesslike industry already in full swing with a potential market for the electrical industry as bright as any of the past applications which the industry has turned into profits and load.

Studies show that there are approximately 12,000 air conditioning installations in the country today, representing an investment on the part of customers of $125,000,000 in equipment. Almost 25 per cent of these were sold in 1935. Where the first air conditioning installations were very large, involving large investments for the customer, the profitable market today is in small installations of one to 20 tons for homes, offices, stores, restaurants, theaters, auditoriums and industrial plants.

Progress in product development has eliminated the necessity of highly specialized technical supervision and engineering. Equipment is available now which permits the figuring of an installation in twenty minutes or less right on the prospect's premises. Promotional and other material is available in abundant quantities both for the training of dealers and salesmen and for educating the prospect.

Here on the Pacific Coast marked strides have been made during the last two years in the development of air conditioning business. Phoenix is called the "air conditioned city." One utility reports sales and load added during 1935 equal to triple the 1934 sales and has set a 1936 quota of more than double the sales last year.

Typical fruits of air conditioning promotional activity can be cited in the case of the Central Arizona Light & Power Co., which last year added to its line 100 installations totaling 719 hp. This company now serves 224 installations with a connected load of 5,151 hp., exclusive of some estimated 3,000 small wet installations in homes in Phoenix. In 1935 Pacific Gas and Electric Co. added 201 installations to its lines with a connected load of 879 hp., bringing the total number of installations to 663 with a connected load of 4,804 hp.

In the pages that follow are descriptions of the 1936 sales programs of Pacific Coast power companies and data on some of the typical installations in this region.

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1,500 Hp. Goal of Edison Air Conditioning Program

By R. C. McFADDEN
New Business Manager
Southern California Edison Co., Ltd.

Activities during 1936 for the promotion of the air conditioning load were based on experience gained over the past few years. Our policy is to stimulate and develop prospects for air conditioning with our own sales force and then call in representatives of various responsible air conditioning firms to close the sale and complete the installation. The obligation for developing air conditioning prospects rests with all of the various field specialists employed in the new business department of our company. Practically every type of building offers a potential prospect. From the industrial standpoint our sales activities will be directed, in general, toward promoting its use in citrus packing plants, bakeries, candy manufacturers, printing establishments, mushroom raising plants and others where controlled humidity and temperature will result in a better product. From the commercial standpoint our activities show that restaurants, hotels, hospitals, office buildings, individual offices, beauty parlors, theaters, mortuaries, apparel shops, and banks offer the best prospects for this type of load.

On commercial prospects, the approach is made with the unit type of room air conditioning. We are prepared to install such a unit on a trial basis with the understanding that in the event of a sale, the deal will be placed through a local dealer of air conditioning equipment. This trial policy should result in lessened sales resistance because the user will have an opportunity of actually enjoying the advantages of air conditioning and find out for himself that it meets the claims made for it.

During the spring an air conditioning school will be held in Los Angeles for the purpose of instructing our field salesmen in the fundamentals of air conditioning. This should enable these men to carry on the sales activity with a minimum of general office assistance.

Air conditioning is proving a very desirable load, and our program is designed to take full advantage of the possibilities in load building which it provides. It is anticipated that the promotional plans will be responsible for approximately 1,500 hp. new load during the current year.

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Climate Militates Against Air Conditioning in San Diego

By P. P. PINE
Engineer in Charge of Power Sales
San Diego Consolidated Gas and Electric Company

Contrary to general thinking, the climate in San Diego is such that air conditioning is not required for comfort except during a few days of the year. During the summer it is relatively cool along the coast where our major prospects are located and consequently air conditioning is not required except in theaters and other such places where considerable body heat is released.

While our industrial prospects are not many, there are several plants which could utilize air conditioning advantageously. To date two packing houses and one theater have installed air conditioning equipment. The company itself has air conditioned its La Mesa office and plans to install a similar installation at its Escondido office within the next few months.

While the prospects are few, the company appreciates the desirability of the air conditioning load and is making every effort to promote installations where the economics justify such action.

Air Conditioning Promotion Requires Sound Sales Policies

By G. E. ZELHART

Air Conditioning Engineer
San Joaquin Light and Power Corp.

Our company has bene promoting the sale of air conditioning for the past four years. During that time sales policies satisfactory to the manufacturers, protecting the consumer and productive of load have been established. Experimenting on the customers or developing new equipment has no part in our program as we feel that the utility can be most effective in a strictly promotional operation. Experience has confirmed the opinion that customer satisfaction is of the utmost importance in the early development of this promising field. Satisfied customers mean a greater volume of business in the long run.

Accordingly, the cooperation of the manufacturers, distributors and dealers was sought to the extent that this company be permitted to provide engineering layouts or at least be given the opportunity to review the dealers' calculations as a check on the adequacy of the proposition before formal presentation to the prospective buyer. This set-up met with the approval of all concerned because it speeded up work, eliminated duplication of engineering efforts among the distributors and gave them more time for constructive selling, standardized the job, put legitimate manufacturers on an equal footing with universal recommendations and stimulated the confidence of the prospective buyer. It effectively eliminated inadequate equipment. How well this policy has succeeded can best be judged from the results obtained. Since air conditioning has been actively promoted by the company, the volume of business secured each year has been 300 per cent greater than that of each preceding year and no job which had the company's original approval has failed to give customer satisfaction.

Because inexperienced salesmen tend to underestimate the cost of an adequate installation, the company has given a great deal of time to the training of its field representatives. It also provides them with a comprehensive survey blank which, if properly filled out, greatly simplifies the engineering of jobs.

A survey of actual kilowatt-hour consumption shows that air conditioning load consumes an average of 1,330 kw.-hr. per horsepower per year. It has an approximate earning value of $25 per horsepower per year. The company's experience shows that revenue of approximately $2.50 is earned for each dollar of air conditioning sales promotion cost expended by the company.

In anticipation of continued growth of air conditioning, the 1936 quota for the San Joaquin Light and Power Corp. was set at 900 hp. Results obtained so far this year have more than justified the optimism in setting this quota.

Our air conditioning sales force consists of all our district salesmen which solicit this class of business and send the necessary information into the general office on the engineering survey form described above. In addition to our district salesmen, one air conditioning engineer is located in Bakersfield and two located in Fresno. These men make the necessary calculations and layouts for the dealers in the nearby territories.

Naturally, we are anxious that this load be developed and believe that it is desirable to have it develop rapidly. However, it is essential that it be developed intelligently, honestly and in a manner which will protect our customers and the future of the air conditioning business.

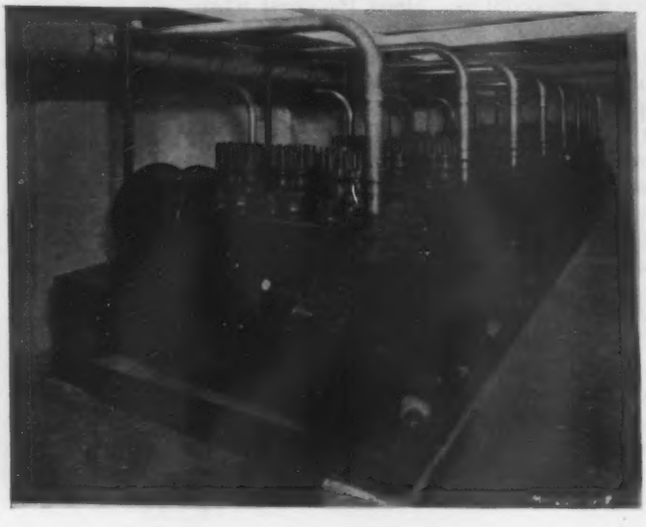
●

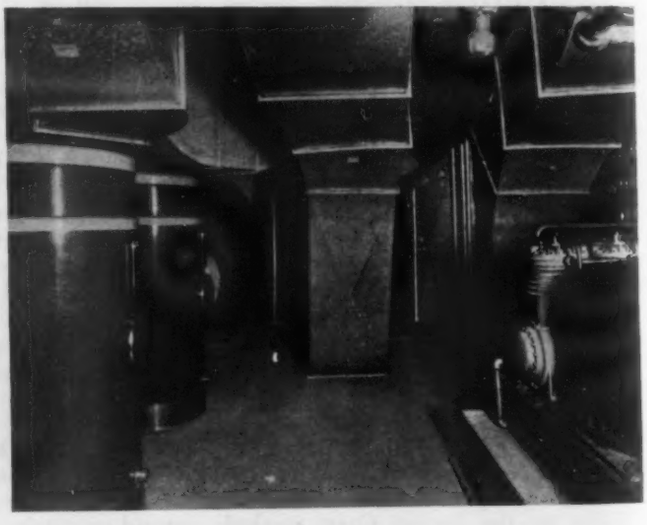
P. G. & E. Sells Unit-type Air Conditioners

Pioneering activity directed toward the largest potential market—the home and the commercial field—forms the basis for the air conditioning sales program of the Pacific Gas and Electric Co. for 1936. Sales in 1935 showed a threefold increase over 1934 with a 112 per cent accomplishment of quota. A bogey of twice the 1935 added load has been set up for this year.

Store Endorses Conditioned Air

Hale Bros. Sacramento department store uses this battery of Westinghouse 20-ton units to insure cool comfort for its patrons. By substituting eight smaller units for one large unit, greater efficiency is obtained from the installation. The number of units in operation depends upon the cooling requirements of the building, there being sufficient capacity to always maintain comfortable conditions under extreme weather conditions





Air Comfort For Reno Club

The Reno Country Club insures comfort for its members with this modern and complete air conditioning installation. At the left are a battery of three General Electric oil burning heating units operating in series, having an output capacity of 825,000 B.t.u. per hour for winter heating. At the right is a 20-hp. refrigerating unit which is a part of the complete air conditioning system for the club. Cleanliness, compactness, and complete automatic control are features of this new central plant which is capable of providing 90,000 cu. ft. of comfort-conditioned air per minute

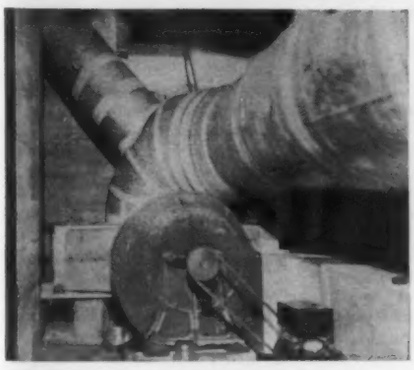
Direct selling activities of the company will be concentrated on unit type room coolers in the dometic and commercial fields since the company believes that these markets hold the greatest future potential. By doing the pioneering educational work and securing typical installations in as many different communities as possible, the company hopes to hasten the time when profitable volume will be available to all dealers who desire to enter the business.

By confining sales to unit type coolers the necessity for complicated engineering calculations is eliminated. Basic formulas which permit the salesmen to figure practically any installation right on the prospect's premises have been evolved. Sales are made by salesmen in the heating department, with air conditioning giving them a balanced sales program which offsets the customary summer slump in the heating business.

The sales force also works with customers who are prospects for central installations which must be engineered, doing much of the preliminary sales work and then turning over the prospect to one of the dealers or contractors specializing in installations of this character. To date this plan of uncovering prospects for the larger installations has worked extremely satisfactorily.

Some 3,000 home-made installations such as this are in operation in Phoenix each summer. An electric fan draws the air over wet excelsior cooling and humidifying it

Blower and duct system for one of the large Phoenix commercial air conditioning installations



The sales organization is trained for air conditioning sales work through meetings held in each of the districts at which representatives of the manufacturers demonstrate and describe their particular equipment. These meetings are spread out so as to maintain the active interest of the sales force. Additional aids to the sales force are being prepared, including a sales manual and a portable sales presentation to be used in selling the customer.

•

Air Cooling, An Old Story to Phoenix

AS Old Sol daily soars closer to the Zenith, making ready to send thermometers in Phoenix, Ariz., bubbling at 110° and better, Phoenix residents just laugh, for they claim to have more air-conditioned homes and buildings than any other city in the United States, regardless of size. And air-conditioning

Water cooling tower used in connection with a type of air conditioning installation developed in Phoenix is concealed by shrubbery

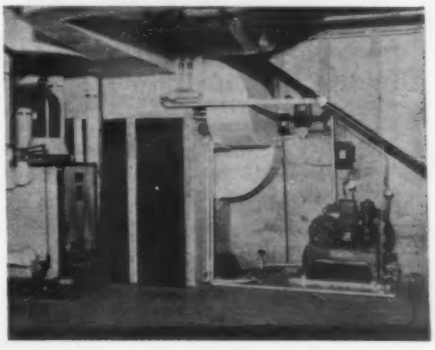
units in Phoenix, eight years ago, numbered exactly one.

It was a hotel man who installed the first unit, initiating the rage for air-cooling which turned the tide of business into, instead of away from, Phoenix during the hot months. Not only did he attract travelers who had previously avoided Phoenix, but he arranged summer rates for local residents who wished to sleep in comfort.

Other hotels, and then theaters, followed his lead. The railroads publicized air-conditioning and dealers began to offer complete units.

With the introduction of refrigerated air-conditioning, the Central Arizona Light and Power Co. took an aggressive part. To correct the impression that air-conditioning "couldn't be much good or the power company would sell it," and to do this without competing with established dealers in the field, the company inaugurated a promotional campaign. The idea of air-conditioning was advertised in newspapers, together with the offer of engineering advice by

Typical Phoenix home (above) in which a central type air conditioning installation like the one pictured below is installed



company experts to both dealer and purchaser. Last summer scores of residents availed themselves of the company's free week-end trial offer, originated to demonstrate the effectiveness and simplicity of installation. Also developed by the company was a monthly payment plan, terms as low as $5.

Stores, restaurants, office buildings, homes, hotels, theaters, all have joined in the swing to air-cooling. Many makeshift devices have prepared, some good, some bad. Effective is a radiator-type air-cooling unit, which was introduced by a local automobile radiator manufacturer. In this unit, room air is fanned through an automobile type radiator, employing cold water for cooling. The water is run through a small cooling tower outside the house.

Most prevalent is the excelsior cooler. It consists of a box filled with excelsior and made to fit over a window. A stream of water moistens the excelsior while a fan draws air through the box and ejects it into the room. Temperature drops of as much as 20° have been produced, but the device almost neutralizes its benefits by raising the humidity. But the users say, "It's better than nothing." A community near Phoenit has 700 electric meters, 300 excelsior coolers.

But Phoenix' boast that it has the greatest number of air-conditioning units does not apply to these devices. It is talking about bona-fide installations. Keeping alive the vision of that one hotel man, Phoenix is planning more real air-conditioning, and more cool comfort for this summer.

Desert style appropriate to its surroundings has been used in the design of the Coachella office of Southern Sierras Power Co. which is a completely air-conditioned office. The plant is located in the basement, reached by the stairs shown in the picture

Power Co. Office is Effective Demonstrator

BEST advertisement of the practicability of air conditioning is the use of it in one's own business. Thus, when The Southern Sierras Power Co. built a new office at Coachella not long ago it installed a complete air conditioning system in the building at that time. The Coachella Valley is at the upper end of Imperial Valley and has summer temperatures as high as 120 deg. Effectiveness of air conditioning under such conditions would prove a valuable sales medium in the promotion of the idea for other customers.

Accordingly, the building was built of solid concrete, reinforced with a 1-in. air space between the outer wall and the inner plaster. An Insulite wall board was placed on the inside with the plaster over it. All of the windows were set in solid with no provision for opening them to the outside air.

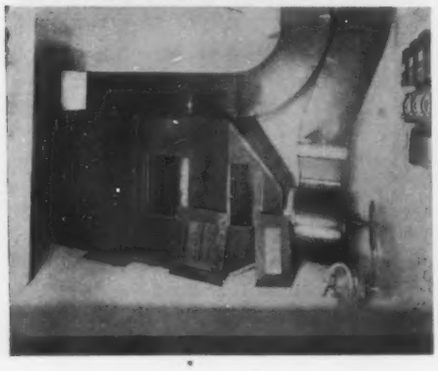
The ventilating and heating system is located in the basement. The company, of course, is fortunate in having an ice company next door from which it brings its refrigerant through a duct lined with cork. This refrigerant is brought into the chamber in which are housed the air filters and circulated through brine grids for cooling of the air in summer.

In winter when heating is required strip heaters are installed in a chamber through which the air passes. Twenty kw. has been installed and operates automatically from temperature controls in the offices on the main floor. Fans are located in the duct system to force the air through the circulating system.

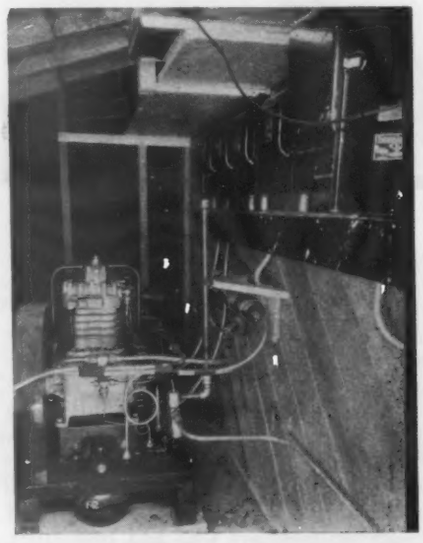
Even the floor was insulated. Most of it is laid directly on the ground. The base slab is concrete which was thoroughly dried out, then covered with a hot asphalt layer upon which was laid asphalt tile. The flat roof is built of heavy planking, over which is laid a heavy asphalt roofing. Under it are panels of Insulite for further insulation.

Among other interesting features of the electrical installation are such details as these: All telephones are on plugs so that they can be moved from the desk to the counter by the attending clerk. The fans in the lavatories are placed on the same circuit with the light so that they are immediately set in operation the moment the lights are turned on.

Air conditioning equipment in the Coachella office of Southern Sierras Power Co. provides heat in winter and dehydration in summer



Desert Home Cooled



Palm Springs home of E. C. Thompson is air conditioned with this 2-hp. Frigidaire condenser, installed by the Desert Electric Co. Electricity also supplies the heating, through thermostatically controlled Thermador units

• AN AIR CONDITIONING UNIT which to a great extent solves most of the problems necessary to be solved in a climate such as that found in California, is being promoted in the San Joaquin Valley. The unit is known as the P & R Coolaerator. A cooling effect is obtained by the evaporation of water inside one set of air passages which are completely isolated from another set of air passages carrying the air to be cooled.

Equipment + +

TO present information regarding the modern air conditioning equipment now available to the industry and the public, the editors invited all manufacturers to submit information. Data on the equipment of those who took advantage of this opportunity are included in the following brief reviews:

De La Vergne

All air conditioning units in the line of the De La Vergne Engine Co., Philadelphia, are of the self-contained type and three of them have as a feature optional equipment which permits their use as heating units through the employment of the Carnot reverse refrigeration cycle. Newest unit in the De La Vergne line is an air cooled conditioner with a capacity of 14,000 B.t.u. per hour. It is housed in a steel case and is available in numerous color finishes.

Models No. 1AA and No. 1½AA have refrigerating capacities of 1 and 1½ tons per 24 hours. Both are air cooled. Both are available in steel or wood cabinets. Reversing mechanism to permit their operation as a heating unit is optional. Similar models without the option of the heating feature which are water cooled are also available.

A unit of larger capacity having a rating of 4 tons per 24 hours for installation as a central system in a residence by the use of ducts or for use in commercial establishments is also available. This unit may be obtained with the optional reversing mechanism.

Frigidaire

Frigidaire's line of condensing units includes twelve models with a wide range of capacities. For large installations the condensing units are installed in tandem. For use with these condensers there are four units for suspension or platform mounting and ten models of the floor type for remote installation.

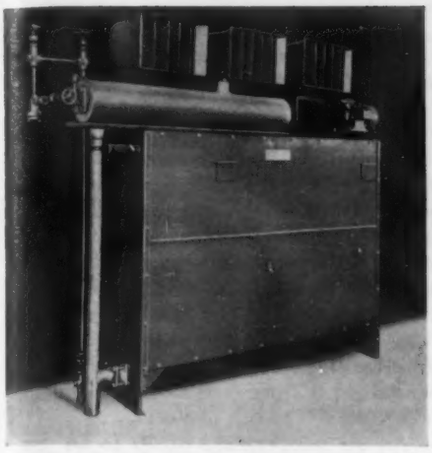
Self-contained Frigidaire air conditioners are available in four models, three of which are strictly for air conditioning and the fourth for heating as well. Models SC-38 and SC-75 cool, dehumidify and circulate the air while model SCV-66 in addition ventilates and filters air entering from the outside.

The Frigidaire line also includes cooling coils for use with central air conditioning systems.

General Electric

Included in the G. E. line of air conditioning equipment are eleven condensing units, two of which are air cooled and nine water cooled ranging in size from 1 to 20 hp. They can be used either with duct systems or for remote connection to room coolers. Where it is impractical to run ducts, there are three types of room coolers for remote installation. Two of these are of the floor type, one is wall mounted and the third is a store cooler for use where decorative appearance is less essential than in residential and office applications.

Self-contained unit coolers include a port-



York industrial air conditioner

able unit for small installations and three year 'round unit room air conditioners.

●

Kauffman

A mobile self-contained room cooler in two sizes (½ and 1 ton capacity) has been announced by the Kauffman Air Conditioning Corp., St. Louis. It is designed for small offices, shops, hospital rooms, hotel rooms and residences.

The units are of the water cooled type and cabinet finish is walnut grain on furniture steel.

●

Parks-Cramer

Newest addition to the line of Parks-Cramer Co., Fitchburg, Mass., is the Parks unit for conditioner designed for use in testing laboratories, small industrial departments and homes. This unit is available in three different sizes, is of the vertical type and is semi-portable. These units filter, wash, humidify or dehumidify and circulate the air. They are built in several sizes for various air conditioning requirements. All of the types are equipped with automatic control.

●

Servel

Servel condensing units consist of twelve models ranging in capacity from ½ to 20 tons. They are available in both air and water cooled models.

Air conditioners include units of practically every type in sizes suitable for a small room, a large store or a restaurant. Included are model ACSD-101 designed for summer conditioning and remote connection to a condensing unit and model ACSU-101 which is a completely self-contained summer cooling unit of the portable type.

For suspension or platform mounting Servel has model ACO-301, a heavy duty unit for commercial use and model AC-101, a suspended unit particularly adapted for summer cooling in remote industrial installations.

●

Strang

Two models feature the portable self-contained comfort cooling units manufactured by the Strang Air Conditioning Corp., Kansas City. Both eliminate the necessity of water connections. A three-piece adjustable window panel permits connection to the outside air. The units are designed for hotel rooms, homes, offices, small shops and stores and hospital rooms. Model 350 has a capacity of 11,250 B.t.u. per hour and Model 351 a capacity of 15,400 B.t.u.

Another item in the Strang line is a new "Evapo-Condenser" cooler for use with condensing units to eliminate water waste. They are available in capacities ranging from ¾ to 6 tons.

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Trane

Included in the air conditioning line of the Trane Co., La Crosse, Wis., is a new unit known as "the Climate-Changer," which may be used for summer cooling with cold water or with a condensing unit. It is a dual purpose conditioner being designed to heat and humidify in winter and cool and dehumidify in summer.

Another Trane product is a new small comfort cooler for use with either cold water or a compressor. It is designed for wall suspension or platform mounting and can be marketed for as low as $70. An evaporative condenser to displace cooling towers and reduce the volume of water necessary in air conditioning installations is another new development of this company.

●

Westinghouse

Condensing units in the Westinghouse line include four items rated at 1¾, 3, 6½ and 10 hp. All of these are air cooled. In addition there are six water cooled condensing units with ratings of 1.6, 2.5, 7.5, 8.5, 20 and 25 hp.

A wide variety of units are available for operation from these condensers. The EH series of floor type units are available in models that provide year 'round air conditioning or summer or winter conditioning. They are supplied for operation either with Freon refrigerant or chilled water as the cooling medium. There are five models in the line for suspended mounting. These are available in a variety of types, capacities and finishes.

A self-contained summer conditioner known as "the Mobilaire," either portable or for floor mounting, is included in the Westinghouse line.

●

York

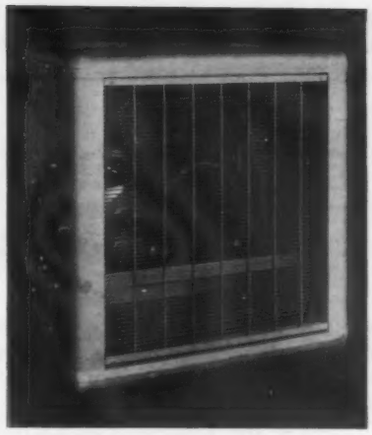
Newest addition to the York Ice Machinery Corp. line of air conditioning equipment is model BA-100, a portable air conditioner of slightly larger capacity than the BA-75, unit conditioner introduced in 1935. In the York portable air conditioner room air enters through a grill in the end of the cabinet and is conditioned and discharged out the top. Outside air drawn in through a rear duct adaptor which fits under a window sash is used to keep the room fresh. Feature of this unit is an electrical panel which permits operation on either 110 or 220 volts. Four new models comprise a new line of industrial air conditioning units designed to meet a wide range of industrial air cooling requirements. They may be installed with or without distributing ducts. They may be used with a refrigerant, circulating brine or cold water.

The complete York line includes an extensive array of air conditioning apparatus, including dehumidifiers, self-contained condensing units ranging in capacity from ¼ to 25 hp., horizontal type air conditioners and heavy duty compressors.

Frigidaire Model SC-80 self-contained unit

Westinghouse self-contained "Mobilaire" unit

Trane comfort cooler



Kauffman mobile self-contained room cooler

Experiments Provide Data For Soil Heating Applications

By J. R. TAVERNETTI
Field Engineer, California Committee on the Relation of Electricity to Agriculture

BECAUSE of the proven economical and beneficial application of electricity as a source of heat in warming propagating beds, experiments have been conducted at the University of California of California at Davis to determine the connected load required under different conditions of soil moisture and air temperature. The common practice is to install 60 lineal ft. of standard soil-heating cable in each 36 sq. ft. of propagating bed, giving a connected load of approximately 11 watts per sq. ft.

Since the propagation of different plants requires different temperatures. ranging from 50 to 80 deg. F., and since heat loss is less when the beds are covered than when they are uncovered, 11 watts per sq. ft. is not satisfactory or economical for all installations. When high temperatures are required in a covered bed, it is not sufficient; when low temperatures are required in a covered bed, it is too great. Although in the latter case the bed will operate satisfactorily with thermostatic control, the size of the bed could be increased without additional cost for electrical equipment.

To obtain data which would permit the most economical installation and satisfactory operation, experiments were conducted in a room where the air temperature was maintained between 40 and 44 deg. F. A propagating bench 4 ft. wide by 7½ ft. long containing 8 in. of sand was used. In this sand 50 ft. of soil-heating cable was placed 6 in. below the surface and 2 in. above the bottom. The cable was laid in hairpin loops running the length of the bed with 8 in. between the legs of the loop. Resistance thermometers placed at various points in the sand, together with thermocouples embedded in the lead sheath of the cable, indicated the temperatures. Glass sash were used for covers and pieces of soil-heating cable were connected in series with that in the bed to vary the connected load.

Four series of experiments were run: (1) one with dry sand in the bed and no cover; (2) one with dry sand and the bed covered; (3) one with wet sand and no cover and (4) one with wet sand and the bed covered. In each series of experiments five runs were made with various degrees of heat per sq. ft. of bed. Heat was on continuously during each run and the temperature was permitted to become constant before readings were taken. The dry sand contained 0.2 per cent moisture and the wet sand 6.0 to 6.5 per cent.

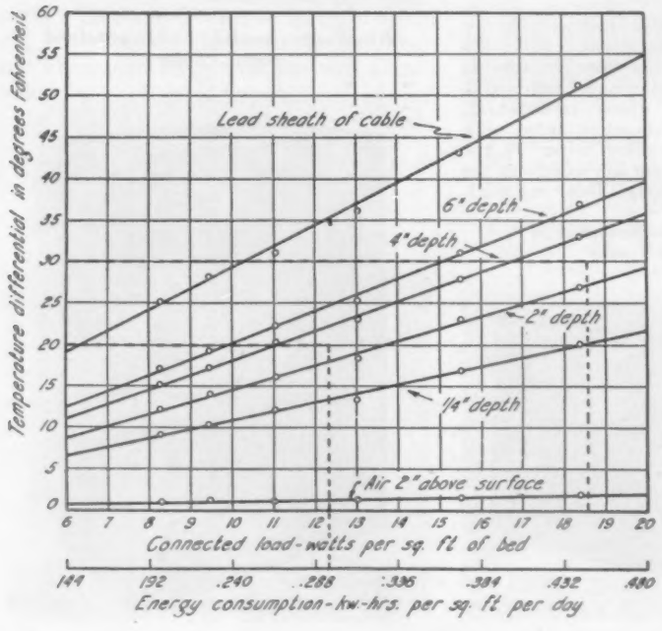
An air temperature of 40 to 44 deg. F. surrounding the bench was used because it represents about the average minimum temperature in an unheated greenhouse. Since the data are based on the temperature differential between the air and the sand, they are applicable to any condition.

Figs. 1 and 2 show the maximum temperature differential in the bed between various points and the surrounding air for wet sand and with various connected loads. Similar data were obtained for dry sand and charted. In the covered bed the temperatures increased throughout over the uncovered bed. This increase was greatest in the air and on the surface of the sand and became less nearer the heating cable.

Fig. 3 shows the increase in the temperature of the lead sheath of the heat-

Fig. 2 — Temperature differential between various points in the propagating bed and surrounding air with wet sand and the bed covered.

Fig. 1 — Temperature differentials between various points in the propagating bed and the surrounding air with wet sand and the bed uncovered.



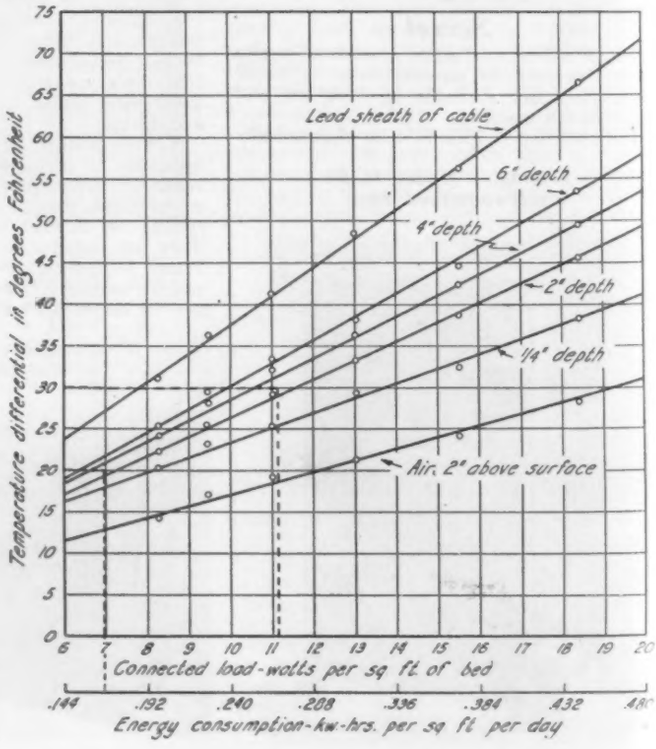


Table 1—Comparison of energy consumption actually obtained in propagating beds used for rooting cuttings and theoretical consumption calculated from Fig 1

(Area of bed, 32 sq. ft. Cable 6 in. below surface and 2 in. above bottom. Connected load, about 14.5 watts per sq. ft.)

Days heated	Average sand temperature at 3-inch depth, degrees F.	Average daily range of air-temperature surrounding beds, degrees F.	Mean daily temperature differential degrees F.	Actual kilowatt-hours consumed	Kilowatt-hour consumption calculated from Fig. 2
133	77	51-65	19.0	1126	1205
133	68	51-65	10.0	542	635
182	77	51-62	20.5	1716	1780
182	68	51-62	11.5	907	990

ing cable with various connected loads and with different media surrounding it.

Figs. 1 and 2 may be used as a guide in determining the connected load and energy consumption for beds where the plants are placed directly in the sand. As an example, assume a propagating bed for cuttings in which a temperature of 65 deg. is to be maintained at a 3-in. depth with a minimum air temperature of 35 deg. and a mean daily temperature of 45 deg. To insure sufficient heat the bed must be designed for the greatest temperature differential, which in this case is 30 deg. In calculating the energy consumption, however, the mean differential is used, in this case 20 deg. If the bed is not covered, Fig. 1 is used. Going across on the 30-deg. temperature differential line to a point midway between the diagonal lines marked 2 in. and 4 in. and then dropping down to the first bottom scale as shown by the dotted line gives about 18.6 watts per sq. ft. as the required connected load. Repeating this process using the 20-deg. temperature differential line and dropping down to the second bottom scale gives 0.295 kw.-hr per sq. ft. per day as the energy consumption. If the bed is to be covered, Fig. 2 is used. Repeating the same procedure on this chart gives 11.2 watts per sq. ft. as the connected load necessary and 0.168 kw.-hr. per day per sq. ft. as the energy consumption.

Table I compares the actual energy consumption and the theoretical consumption calculated from the charts for two different winters in two beds in practical use. The beds used for rooting cuttings were located in an unheated greenhouse and were not covered. One bed was set to maintain a temperature of 75 to 80 deg. at a 3-in. depth in the sand, and the other 65 to 70 deg. at the same point. The actual energy consumption was lower than the calculated, probably because of two factors: (1) the beds were not kept so wet as the experimental one, and (2) radiation from the sun assisted in the warming. The latter factor was probably also responsible for the larger consumption the second year as compared with the first; there was considerably more rainfall and less sunny weather during that winter.

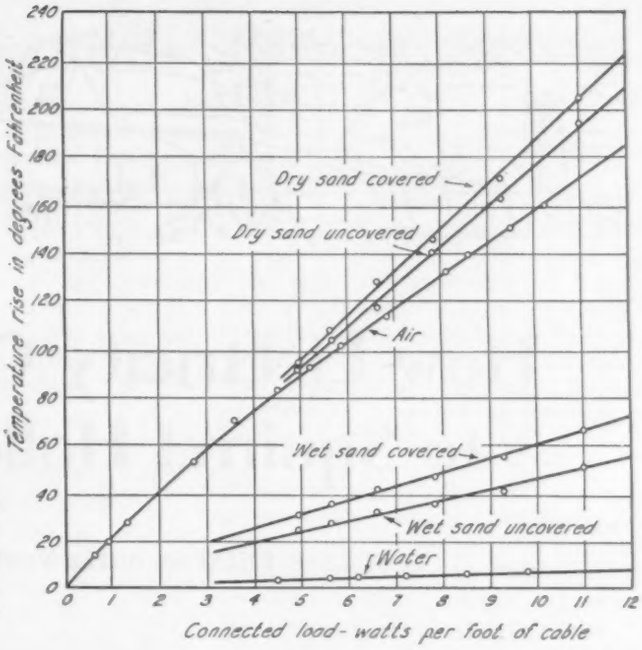


Fig. 3 — Temperature rise of lead sheath of cable when surrounded by various media. Rise when buried in sand is taken as differential between sheath temperature and air temperature surrounding the bed

Fig 3 can be used as a guide in determining the safe connected load per foot of cable. The manufacturers' recommendation is 6.66 watts per ft. As the chart shows, if the cable is not injured by this connected load when surrounded with air or dry sand, it will not be injured by double that amount when surrounded with wet sand.

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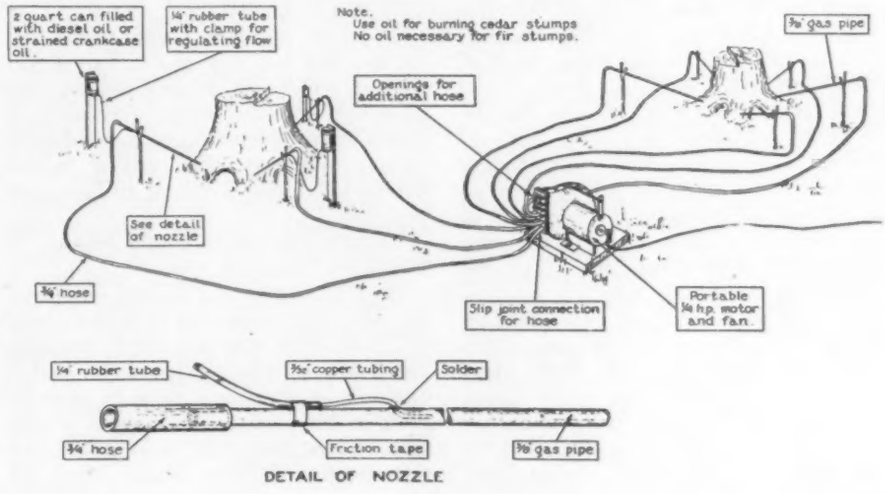
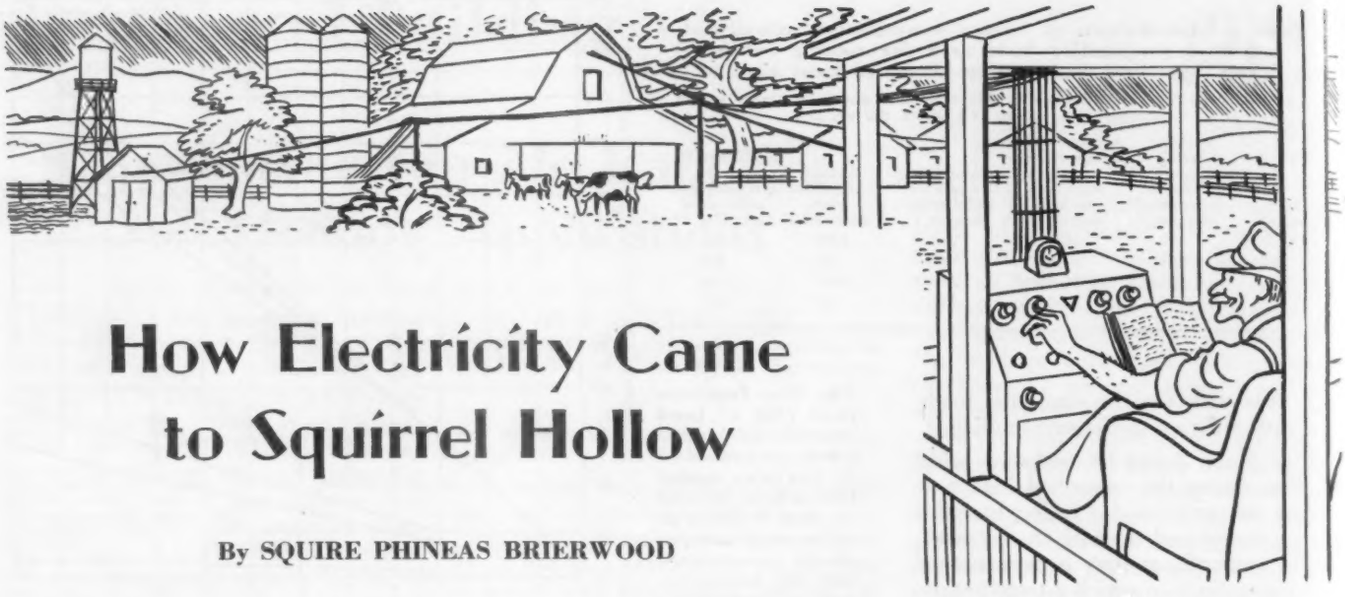
New Technique for Burning Stumps

Motor-driven fans have been used for many years for burning stumps in order to prepare cut-over land for agricultural purposes. However, cedar stumps have always presented considerable difficulty, since the forced air draft method which always works so well with fir, hemlock and spruce stumps fails to speed up burning of cedar. D. C. Pettibone of the Puget Sound Power & Light Co. recently worked out a satisfactory method of feeding diesel or strained crankcase oil into the stump which economically gets rid of cedar stumps and roots.

With the assistance of the oil can and nozzle shown in the accompanying drawing such stumps can now be destroyed with a minimum of effort and cost. Approximately 6 gal. of oil are required to destroy a 4½-ft. stump. The flow of oil is regulated by a cock or clamp on the rubber hose and is permitted to drip into the tube just fast enough to keep the fire burning vigorously. Experience has shown that a small amount of oil cuts the stump faster than a large amount.

Diagram of set-up for quickly burning cedar stumps from cut-over land by the use of oil to supplement electric forced air draft. At the bottom is a detail of the nozzle used


2 quart can filled with diesel oil or strained crankcase oil
¼" rubber tube with clamp for regulating flow
Note. Use oil for burning cedar stumps No oil necessary for fir stumps.
⅜" gas pipe
Openings for additional hose
See detail of nozzle
¾" hose
Slip joint connection for hose
Portable ¼ h.p. motor and fan
¼" rubber tube
3/32" copper tubing
Solder
¾" hose
Friction tape
⅜" gas pipe
DETAIL OF NOZZLE



How Electricity Came to Squirrel Hollow

By SQUIRE PHINEAS BRIERWOOD

THIS month, folks, has been anotheranother busy one for us all back here in the Hollow. The reports previously sent explained the installations made in two departments of the farm—chicken and hogs. Of course, it is a little bit early from the money standpoint to know for sure just how great the effect of KILLOWHATS on Hogs has been but ma figured she made over $32 on eggs last month. As this is just about that much more than she ever did before in any winter month I calculated that there must have been some mistake, so we made a three-way check—Lem Brewster down at the grocery, Electric chart in the kitchen, Electric eye in the chicken house itself and everything seems to come out alright so I guess that's about it.

In looking over some of the records the other evening it occurred to me that you might like to know just how this Electric work started back here. I suppose I have been just a little bit luckier than some of my neighbors. You know —no, I guess you don't know—but there was a fellow down in Woodlin (County Seat) who did know last fall I took my two prime hogs, BLACK BOY and LILY WHITE, down to the Oakdale County Fair. Caleb Winkle, neighbor of mine down on the old South road, had a hog entry too, a Berkshire the same as mine. Between Caleb and me it always has been sort of nip and tuck when it comes to hog raising—a few other things, too. Well, his entry was competing with my BLACK BOY and as the judges were standing around one of them noticed that Caleb's entry didn't have any tail. Right away one of them suggested that maybe Caleb had developed a new breed and they were about to give him the GRAND AWARD for that when young Stub Callows, Jeremiah's youngest, spoke up and said, "that ain't no new breed, he pulled his tail off in the cold spell about two weeks ago."

It came out then that Caleb kept his hogs in an old building and this particular hog happened to lie on the floor one night, back against the outside wall, his tail sticking right out of a knot hole. The weather changed during the night and we had a heavy fall of snow, in fact the fool hog had his tail snowed under and froze fast on the outside at the same time. Hours later he woke up, and feeling himself sort of anchored, gave a sort of yank and that's how Caleb's new breed petered out or was pulled out. Of course it was clear sailing for me after that with my two—in fact the Oakdale County *Breeze* published a picture of the three of us—me right in the middle—and the Editor said for STYLE and CLASS I had won the Blue Ribbon. I have all the credit to KILLOWHATS for on my farm the hogs are kept warm by Electricity. Seems there's no limit to what it will do once it gets started.

To go on, however, I want to say that on the very last day of the Fair I was sort of wandering around the big display hall looking things over when a young chap stepped up to me and said, "Good afternoon, sir, you're Squire Brierwood from Squirrel Hollow, are you not?"

"That's my name, young fellow," I told him. "What is yours?"

Said his name was Elliott — forgot the first part—and said he heard about my prize hogs and just got to wondering if his company—Electric he said—couldn't be of some service to us folks back in the Hollow. I thought it real nice of him and right away asked just how he figured they could. Then we sit down and he told me all about these KILLOWHATS, how Electric workmen did all the work. Said they were the best hired men a farmer could possibly have, did the work quicker and better, and besides paid themselves their own wages. Went on to say that they were on the job continuously, in fact never slept at all, never got tired or grouchy, never grumbled nor complained, worked without being watched, attended to their own business (I thought that was a great thing right there), and didn't even eat anything. Of course I didn't tell him about my hired man—guess some of you know him—being the biggest eater in Oakdale County. It seemed to me that the millennium must have arrived if hired men can work and act like that.

The more I thought over what he said the more I began to think there must be a lot of things I'd been missing so I invited him up for a chicken dinner. Wish I had time to tell you about ma's dumplings and noodles. Didn't say a word about the new sausage we had just made—reckoned if he stayed all night he would have a pleasant surprise for breakfast, didn't even tell him about my Spitzenburg cider—some of it sweet yet. Well, before long up he came and brought another young chap with him. They tramped all over the farm, figuring and measuring and making a lot of notes in a book. You know the rest I guess. Two departments here are full of KILLOWHATS, others are nearly finished, and some are just starting, and by the time the snow melts all the work will be done. I did aim to give you my COW report this month but thought you might like to know how the NEW ERA really came to Squirrel Hollow. COWS and KILLOWHATS will be along next month.

With the Trade Associations + + +

[An Exchange of Plans and Ideas for Assisting the Industry in All Branches to Solve Some of Its Problems of Trade Relations and Business Ethics]

Analyzes Association Goal in Parting Address

RESPONDING to a tribute to his untiring energy and devotion to the cause of contractors while president of the San Francisco Electrical Contractors Assn., paid him by a record meeting of the association, Lloyd Flatland stated what to him appeared to be the fundamental need for contractor organization.

"If you will stop to realize that the consumer, in our case the general contractor, sets you at each others throats in order to benefit himself with lower prices; how he talks to you about what your competitor is offering or doing in order to break you down; how he keeps you at your wits end to run your business in a way that is respectable and reasonably profitable, you will realize how much better it is to have an organization like this, in which you can iron out your differences by talking things over, and hold fast to your own business interests because you know that your competitor is holding to his. If you have the means to talk things over, and to check up with each other whether the things the customer tells you in order to break you down are true or just chiseling, think how much better it is than to live in suspicion and fear of every other poor devil who is in this same business and trying to make a decent living out of it," said Mr. Flatland.

He then pointed out that over 80 per cent of the association's program had worked successfully. But because it had worked smoothly this part of the work was forgotten and taken for granted. It was the 20 per cent of tangled relations or ailments which had received all the publicity and loomed large because it was noisy.

Flatland urged contractors to value in their true proportions of benefits and complaints and to hold to measures which have helped the majority of contractors in the majority of cases to make a profitable job out of what otherwise might well be a gift to a general contractor under sharp competitive practices.

Likewise he pointed out that since wholesalers are organized, manufacturers are organized, and labor is organized, the only way in which contractors can hold up their balance of power against such organized groups is to be strongly organized themselves.

H. C. Reid made a presentation of a cigarette case containing a large piece of currency as a token of appreciation from the association to its retiring president. Clyde Chamblin, new president paid tribute to the sincerity and devotion to contractor problems of his predecessor.

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Chamblin Again Heads San Francisco Contractors

CLYDE L. CHAMBLIN, former president not only of the San Francisco and California state associations of Electragists but of the national association as well, was elected president of the San Francisco Electrical Contractors Assn. at its meeting Jan. 30. With him were also elected a board of directors representing the conservative group in the San Francisco association.

Louis Douat, general manager of the Buzzell Electric Works, San Francisco, was named vice-president, and Ed Martin, Sterling Electric Co., was re-elected secretary, as was Ed Dowd, Dowd-Seid Electric Co., treasurer. The board of directors consists of George Smith, Smith Electric Co.; Kenneth Ryals, Stone-Ryals Electric Co.; C. B. Kenney, of Kenney Bros.; F. O. Sievers, of Kuchel-Sievers; Pete Decker, Decker Electric Construction Co.; H. C. Reid, and Sam Radelfinger, Radelfinger Bros.

In accepting the presidency Mr. Chamblin enunciated a policy of conservatism and greater economy in the administration of the association's activities. Simplification of the methods of association procedure was also promised. Said Mr. Chamblin in a message to the members:

"We mean to do those helpful things for our branch of the industry that will appear to your own sense of willing cooperation, rather than fear of being penalized for breaking a rule with which you are not in accord due to its questionable result.

"We have tried all sorts of plans to make our members honest and fair in their dealings with each other, but the result shows that fair dealing cannot be forced into an unwilling mind.

"We propose, therefore, to proceed on a plan of simple, understandable business ethics and if a member shows by his repeated conduct that he does not intend to work with his fellow members along these lines, the sooner he is eliminated from our rolls, the better."

Meetings of the association have been re-established on a weekly luncheon-time basis, with meetings each Thursday noon, instead of alternate noon and evening meetings, which had been established to accommodate many members themselves working during the day who found it impossible to attend noon luncheon meetings.

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• NORTHWESTERN SECTION, International Assn. of Electric Inspectors, has issued a special invitation and appeal pamphlet directed to the "authority enforcing the electrical code." It is being mailed to all inspectors and to all branches of the industry throughout the Northwest. Invitation and appeal is made to join and take part in the activities of the Northwestern Section of the inspectors' organization. A list of 29 excellent reasons for membership and attendance are enumerated, as well as a brief summary of what the association is, a listing of the various classes of dues, and a short history of the group.

•

Reorganize Radio Assn. for Interference Work

Pacific Radio Institute is the successor of the former Pacific Radio Trade Assn. in San Francisco and the Bay area. The reorganization of the institute was undertaken under the leadership of George Eberhart, president. Arthur E. Rowe has been made managing director on a voluntary basis. The activities of the institute will be confined chiefly to those of interference work. This activity is supported by the utilities, street railways, telephone company and others.

According to Mr. Rowe, with the advent of more short wave sets the problem of interference becomes very important. Excellent cooperation has been given by the utilities in clearing up interference caused by their equipment. The highest percentage of causes for interference found recently has been from oil burners and defects in the interior wiring of the premises themselves.

All sales promotional activities formerly carried on by the trade association are to be made a part of the activities of the Electric Appliance Society of Northern California. However, it is planned to work out some means of passing on to distributors, for their dealers, tips as to prospects for radio sets disclosed as a result of interference work. Amendments to local ordinances to deputize inspectors are also sought.

In the Realm of Science + + +

[Devoted to the research and scientific developments which affect the electrical industry and which are being carried on in the engineering departments of Western universities. Edited this month by Dean E. A. Loew of the Electrical Engineering Dept., University of Washington]

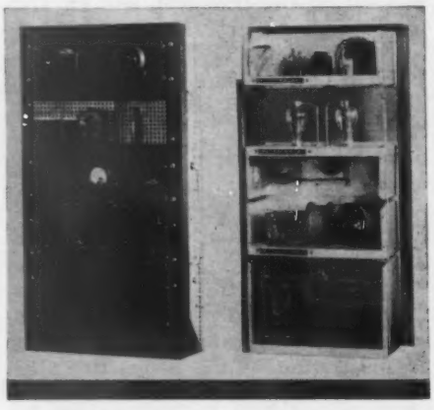
Fish Migration Study Aided by Electrical Development*

Electronic Detector Locates Fish Carrying Identification Tags Of the U. S. Bureau of Fisheries. Commercial Fisheries Aided By Investigations of Migratory Habits of Fish

THE APPLICATION of electrical science to new and varied problems is strikingly demonstrated in a recent development carried on in the Engineering Laboratories of the University of Washington. In this development the University cooperated with the United States Bureau of Fisheries in its work of perpetuating the fishing industry in American waters.

To protect intelligently this industry, the Bureau has planned a thorough study of the migratory habits of the various fishes of commercial importance a study which is now in progress. The present method of tracing migration consists of tagging individual fish and recovering these tages when the same fish are caught later commercially. In the case of the larger species, the tag may be fastened to the fish externally, so that recovery may be accomplished by means of inspection. Such a method, however, was found unsatisfactory in the case of the smaller Pacific herring, *Clupea palassii,* which are now tagged by having sheet-steel stampings, 3/4-in. long by 5/32-in. wide by 0.030-in. thick, inserted through an incision in the abdominal cavity. Thousands of the fish are caught and tagged in the spring of each year. Tags used in different localities are stamped with previously-determined code symbols and with the initials of the Bureau. Later in the season many of these tagged fish are caught and are sold to reduction plants, the maximum ratio of tagged to non-tagged fish being 1 to 100,000. Recovery of tags can be made by visual inspection when the fish are cleaned individually, as is the case with salmon; but when the fish are to be reduced to oil and meal, the recovery is much more difficult.

In general, the method utilized by the Bureau has consisted of removal of the tags from the finished meal by passing the meal over an electromagnet. This method is not considered entirely satisfactory. It does not afford a means of identifying the individual fish for purpose of detailed study and determining the specific location (within limits) in which it was caught. Some method is desired which will allow the tagged fish to be identified and segregated as they are unloaded from the separate fishing boats. This was the problem presented to the University of Washington Engineering Experiment Station, for solution.



Front and rear views of the amplifier and control assembly (covers removed) for detection of herring tags developed by the E. E. Department of the University of Washington

Several methods of detection were examined by Siegfried Hansen and George K. Barger, graduate students in Electrical Engineering, to whom the problem was assigned. After numerous tests they concluded that the change of inductance due to the presence of magnetic material within the field of an air-core coil offered the most promising method of solution. For a given quantity of magnetic material the maximum change in inductance is produced when the material lies within the coil. Accordingly the coils had to be sufficiently large to allow passage of the total input to the plant, approximately 250,000 fish per hour. With coils of such dimensions, the relatively small herring tags produce very little change in the total inductance, and therefore an inductance-bridge circuit must be incorporated into the system for effective utilization of this change.

The bridge circuit, of the type known as the Hughes' induction balance, is formed of four identical coils. It has a maximum sensitivity to unbalance when the two pairs of diagonally opposite arms are closely coupled. Under these conditions, the presence of any magnetic material—such as the passage of a herring containing a tag—in the field of either pair of coils causes not only an increase in the self-inductance of both coils of the affected pair but also an increase in their mutual inductance. When the bridge is driven by a vacuum-tube oscillator, a voltage unbalance of approximately 1/10 volt is obtained.

In the construction of the oscillator, a frequency of 1,000 cycles was selected because it could be generated and amplified by readily obtainable commercial equipment, and because it was also about the highest frequency which could be used without encountering difficulties arising from stray capacities and from eddy currents set up in the bodies of the fish.

Several methods of amplification and rectification were investigated for utilizing the unbalanced bridge voltage, with the result that a detector circuit of the balanced demodulator type was adopted. This detector functions as a harmonic analyzer since it multiplies the signal input by a sine wave of fundamental frequency, the latter in this case being obtained independently from the 1,000-cycle, bridge-driving oscillator. The demodulating action produces a d.c. output current proportional to the root mean square value of the fundamental component of the signal input, the system being unaffected by harmonic voltages. In addition it has the extremely important advantage of being much more sensitive to small signals than the regular bias-type detector.

The d.c. output of the detector circuit controls a sensitive relay which in turn

*Permission for publication by courtesy of the United States Bureau of Fisheries.

operates the mechanical fish-rejecting equipment through the medium of a pair of mercury-vapor thyratrons.

In accordance with the results of this research, one complete tag-detecting unit was assembled, front and back views of the supply and control unit being shown in the accompanying illustration. The top section contains amplifier, balanced demodulator, and relay equipment; the center section, the thyratron control and output circuits with the tubes mounted directly above; the next lower section, the 1,000-cycle, bridge-driving oscillator, together with its necessary pickup coils; and the bottom section, the plate supply batteries. These latter are necessary because relatively few of the reduction plants are equipped with a suitable a.c. supply for rectifier operation.

The equipment was placed in operation at the Port Armstrong, Alaska, reduction plant for a portion of the 1935 season. Considering the temporary nature of the installation, the results obtained indicated marked improvement over the methods used previously in such plants for tag recovery.

Goodwill Building + + +

[*"With public sentiment nothing can fail; without it nothing can succeed; consequently he who moulds public sentiment goes deeper than he who enacts statutes or pronounces decisions."—Lincoln.*]

Billing Methods Affect Goodwill

16 Bills are never a source of pleasure to the recipient, regardless of how small the amounts may be or how enjoyable the articles or services for which the bills are rendered. For this reason every effort should be made to give bills as many pleasing characteristics and as few that may be irritating as possible.

Many if not most of our customers have formed the habit, especially during the recent years of depression, of scrutinizing their bills rather closely and checking them for possible errors. The electric companies should take advantage of this habit and utilize it as far as possible to build goodwill.

All merchants of commodities have learned that they must render itemized bills in order to keep the goodwill of their customers. It is true that the electric bill covers only the sale of kilowatt-hours of electricity, but our complicated rate schedules insist that all kilowatt-hours are not the same, or at least are not the same price. Most of our customers realize this, but very few remember the unit prices or the size of the different blocks of power, and consequently they cannot check their bills unless they obtain a copy of the rate schedule and always keep it available. The customer should not be inconvenienced to this extent. In fact, the electric company should furnish this information to the customer with every bill, merely as a matter of fairness and courtesy.

The rate schedule could be printed on the front or back of the bill, or a sticker showing the schedule could be attached. Probably the best method, however, would be to actually itemize the bill, showing the service charge, and the unit and total cost of each block of power consumed. This method would cause a little more work in making out bills, but it would have the advantage of being easy for the customer to check. It would also indicate more clearly to the customer how the cost of additional use of electricity is lower after each rate block is passed.

There is another source of irritation on electric bills that could well be eliminated. On the reverse side of the bill there are rules and regulations in fine print which are actually a threat to the customer that his electricity will be shut off if he doesn't pay his bills regularly, and would not be tolerated on the bills of any merchant in a competitive business.

Supplying electric service is a monopoly and the customer cannot go to another electric company if he is dissatisfied. However, if we want goodwill, we must be considerate even in rendering bills.—*W. T. H.*

Rules

TO intensify interest in the problem of building customer goodwill ELECTRICAL WEST will pay $2.50 for each idea or suggestion deemed worthy of publication. In addition all suggestions received during the period from November 1, 1935 to October 1, 1936, will be eligible for $50 in awards to be given by ELECTRICAL WEST, the P.C.E.A. and the Northwest Electric Light & Power Assn. These awards will be based upon the goodwill building merit of the idea, its practicability, adaptability and originality. The judges will be officers of the two associations and the editors. The awards will be $25, $15 and $10 for the three suggestions ranked first, second and third by the judges. In the case of ties duplicate awards will be made.

Suggestions should be limited to 400 words, preferably less. Composition does not matter as manuscripts will be edited for publication by the editors. Ideas will be published over a nom de plume, provided the author indicates that such is his or her wish. They should be sent to the editor.

Radio Might Be Used To Build Goodwill

17 Most utility advertising is quality advertising of the highest type. It is usually designed and timed for a direct and local appeal. Because it is direct and localized it undoubtedly accomplishes all that is intended for it. Apparently no great thought is given in most advertising to the goodwill phase of the utility problem. Probably this results from the public-utility goodwill being a national or universal problem as well as a local one.

There is a medium, although, practically unused at the present time by the utilities, that could if properly organized and conducted be made to yield not only an abundance of increased business but have a powerful and favorable influence in the moulding of public and customer goodwill. It is radio, that marvelous invention, second in importance only to its great parent—electricity—in its civilizing influence upon all the people of the world. Vast numbers can be reached quickly and effectively by radio as evidenced by the great popularity of some of the many programs now broadcast over the air.

To be really effective a nationwide hookup should be made with a program of universal appeal. The introduction and marvelous growth of the electrical industry itself would be an ideal theme. Episodes, experiences and facts related to the industry, simplified and dramatized for a universal appeal similar to the "Winning the West" series would be most effective in the re-establishment and holding of that much to be desired public goodwill.

A project of this type could be conducted under the auspices of the already established Edison Electrical Institute with each individual utility subscribing proportionately according to size and importance in the industry with benefits accruing to each in like proportions.—*R. V. P.*

EDITORIAL + + +

Kitchen Modernization

WHEN a "package" sales program is evolved which will stimulate appliance sales, promote wiring and increase load, then there is ample reason for cooperation between manufacturers, power companies, distributors, wholesalers, retailers, contractors and other electrical interests. The national kitchen modernization program is a definitely saleable plan that meets those specifications.

What the plumbing industry has done to the American bathroom, the electrical industry can do to the American kitchen. Public interest has been awakened to the advantages of a modern electric kitchen. Sporadic advertising coupled with a great mass of editorial comment in women's magazines indicates that the time is ripe for a concentrated sales drive which will give the housewife the labor-saving, health, beauty and esthetic advantages of a kitchen modernized by electrifying. It is estimated that one out of every four kitchens is a real prospect for modernizing.

The national framework for the program has been perfected. Funds have been contributed by manufacturers for 1936. The operation is based upon a three-year plan. Promotional material is ready for use. Nothing remains to be done except for each locality or each region to set up its own local activity. Success of the program will depend upon the effectiveness and the effort displayed by each local bureau. And so too will the profits.

Professional Selling

VIEWED in perspective, selling of electricity and its uses in the Northwest may be said to have grown up. The recent conference of the Business Development Section, Northwest Electric Light & Power Assn., at Spokane demonstrated that. The industry, which for so long has been considered as yet in its infancy, seems to have developed its selling technique and methods on a par equal to that of the automobile. Last year's sales results amply proved its professional status.

The Spokane conference was likewise an excellent example of the idiocy of any claim that a power trust exists. Too much individualism was evident to permit of any such agreement. Every company had a different technique for building load—and was proud of it. Nor was there much indication that any company would slavishly follow the methods of any other company. Quite the reverse. Each stated its own particular case—explained its own peculiar problems and solutions, and though it gave tolerant ear to the other fellow's problems, gave no inkling of following his lead.

While such a situation may give a superficial impression of lack of unity or harmony, such was not the case. And doubtless as time goes on many of the ideas interchanged will find themselves reappearing in other companies' sales plans of the future—perhaps unrecognized as such. But the real point is that each was a self-reliant company, arriving at its decisions of its own accord, and that any collusion between them would be difficult to attain.

Indeed the strength of convictions as to the superiority of either "all service" selling as against "specialized" selling or "selective" selling, or even "high pressure" selling, gave rise to some interesting swordplay. Likewise were ideas divergent as to worth, difficulties and implications of dealer cooperation—some having success, others not, others trying.

Inspiring were the strong challenges to a renewed courage to meet the attacks against the industry by outselling the politician in every "competitive" attempt to take the industry's customers and goodwill which came from several speakers, notably Frank Post and Dr. G. W. Allison. If, as the latter said, the Northwest is the "Gettysburg" of the utility industry, the sales forces and sales programs should find their industry well prepared for the test.

Inherent Advantages

WHEN automatic control is thought of in these modern days, electricity is immediately considered the most responsive method to provide it. In fact, there is an avoidance of complicated mechanical means for providing control of equipment or machinery. Even the gas range, to go automatic had the choice of a complex system of pipes and valves and a mechanical clock or an electric system of control—and most gas range makers chose the electric.

Is it not a wonder then that makers of electricity utilization devices should not have capitalized sooner on the inherent control possibilities of electricity in the design of their equipment? Instead they merely applied raw electric heat to a standard device using other fuel and sought to face the wall of habit and competitive cost with electricity as a substitute fuel only.

One of electricity's greatest sales features is its capacity to regulate and operate itself. Designers of electrical devices will advance their products faster and lift them from competition with other fuels quicker if they make use of the inherent advantages of this more-than-fuel, electricity.

What Price Merchandising?

HOW much can justifiably be spent by a utility for new business expense? Are merchandising expenses legitimate charges against this account? Commercial managers and management executives have a variety of answers to these questions. So also do the regulatory commissions, particularly as regards the relationship between merchandising operations and other new business activities.

Thus more than casually interesting is the ruling on these items contained in a rate order just issued by the Washington Department of Public Service governing the operations of the Pacific Power & Light Co. Commenting upon testimony and exhibits introduced by the company in justification of its merchandising operations the order states:

It was shown that whereas the utility at one time sold approximately 75 per cent or 80 per cent of all electrical appliances purchased by its customers it now handles only about 20 per cent or 25 per cent of such business in its territory and that this situation has largely been brought about through encouragement given by the utility to local dealers to handle these products direct. The utility contends that if it is to obtain the full advantage of all possible load building through the use of the many available modern electric appliances respondent must maintain an organization of trained employees to contact and acquaint the customers with the convenience of such appliances and their proper use and care. Section 8, Chapter 165, Laws of 1933, provides that any merchandising carried on by a utility shall not constitute a part of its public utility business. What constitutes merchandising within the contemplation of the statute? In most instances the business of selling and servicing load building appliances as carried on by utilities is directly a part of and inextricably interwoven with the utility business itself and it is extremely difficult to fix the line of demarcation between what is prescribed and what is legitimate, much less make an accurate segregation of costs, etc.

During the past three years the department has conducted a large number of valuation and rate cases and as a result we have analyzed and passed upon activities of this nature many times. It is undeniably true that when merchandising activities are carried on, directly or indirectly, by a utility company in such manner as will effectively promote new business and improve the system load factor the results will be beneficial to both the utility and its rate payers. Revenues are increased, operating conditions and quality of service are improved, and rates can be reduced. Nor is there any resulting injury to private merchandisers of electrical appliances, the people who started the demand for a statute such as we have. Private dealers seldom do the necessary missionary work but when the demand for appliances has been created and enlarged by the utilities these same dealers reap their full share of a rich and unexpected harvest of profits. We are constrained to believe that the Legislature did not intend to divorce merchandising activities from the legitimate utility business, except for good cause, such as stealing the business from other dealers or conducting the same as a separate merchandising business for profit.

The record shows that for the past several years respondent has been conducting an intensive campaign to educate its customers to the use of load building appliances. Its sales promotion work has been planned and performed so as to bring a fair share of the sales to private merchants. Of course, new business expenses have increased considerably. On the other hand, it is probable that a considerable portion of the increased revenues received in 1934 and 1935 is traceable to those increased expenditures.

The entire industry can concur in the progressive findings of the department in this case. Where the utility merchandises cooperatively on a sound basis which encourages both sales promotion and competition on the part of all retail outlets, everyone prospers and profits including the ultimate consumer.

Tax Slackers?

IN the welter of schemes to raise more taxes to pay the ever increasing load of government, the administration might do well to consider one much neglected source—the municipal utilities. The municipal or other governmental utilities on their part, if they truly want to be honest and fair in policy and in performance, will not shirk their share of the burden which, if it is necessary to alleviate human suffering, certainly should be carried by them in common with all other forms of enterprise.

On the premise that a government cannot be taxed by itself to support itself, exception has been fought for and won by the municipal utilities. That would be true if the municipal utilities did not also claim to be business enterprises, run in a businesslike manner, and not a mere paternalistic service made necessary by public exigency.

Some of these, it is true, claim to render back to their communities benefits in lieu of taxes; some even claim to make their towns more or less taxless, although this perhaps is a matter of bookkeeping. But even if and where this is true, the benefit is so strictly local that it is an intensely selfish attitude which considers this the full public duty of such a municipal utility. For by its exemption from federal and state taxes it throws upon its neighbor cities and especially the farm communities the entire burden of supporting federal relief, defense and other public welfare. In effect it is a slacker in its responsibility to the state and nation, just to gratify local special privilege.

Surely many such cities and communities have more self respect than is represented by so selfish an attitude. Certainly if they realized they were slackers to the welfare of their country, they should release their claim to this exemption from their fair and just share of the nation's load of public debt. After all they are beneficiaries of the government's public spending as well as those other communities who pay more than their share.

And if municipal utilities truly wish to demonstrate integrity and public spirit, they will welcome the opportunity, rather than resist the suggestion that they carry their part of the national load of welfare and veterans' bonus indebtedness.

News of Note + + +

P. C. E. A. Effects Program Expansion

Expansion of the activities of the Pacific Coast Electrical Association so as to permit its more effective operation as an all-industry coordinating and discussion group has been approved by the board of directors. Plans for conclave programs have been expanded and a new section established to provide opportunity for new groups to meet and exchange ideas. The program is the culmination of six months of study by a special committee appointed by President F. O. Dolson.

Under the new setup provision is made for parallel sessions of small groups with common interests and common problems at the semi-annual conclaves. Guidance committees of the various sections will plan programs so as to provide sessions for these groups. In the case of the Business Development Section the subdivisions will cover these subjects: lighting, power, appliances and advertising and publicity. The Operating Economics Section would be subdivided as follows: production, transmission and distribution, metering, safety and transportation.

The new section will be known as the Administrative Services Section and will have subdivisions covering such subjects as customers' service, accounting, taxes, purchasing and stores and insurance.

The new groups will not operate as committees, but will merely function during the conclaves as discussion bodies. If, during the course of the discussions, problems develop which warrant the appointment of definite committees for their solutions, recommendations would be made to the guidance committees for study and approval. Committees might then be appointed by the board of directors for the specific purpose of studying and solving the problem, their jurisdiction to cease as soon as their work has been accomplished. The only standing committees will be those charged with the specific guidance of the three sections, the industry coordination committee and the Pacific Coast Electrical Bureau committee.

Approval was given by the board of directors to the personnel of the newly organized industry coordinating committee whose purpose it will be to serve in an adjudicating capacity where problems arise involving the common interests of two or more branches of the industry. Nominations for this committee were submitted by each of the five branches of the industry in northern and southern California. Personnel consists of the following: Manufacturers, J. E. Crilly, General Cable Co., S. F.; A. M. McMillan, Harvey Hubbell, Inc., L. A.; wholesalers, A. H. Nicoll, Graybar Electric Co., S. F.; C. H. Thrane, General Electric Supply Corp.; L. A.; contractors, Edward Martin, Sterling Electric Co., S. F.; F. R. Ulbrick, Ul-hart Electric Co., L. A.; inspectors, Ben C. Hill, Oakland; Arthur C. Veit, L. A.; utilities, H. M. Crawford, Pacific Gas and Electric Co.; W. C. McWhinney, Southern California Edison Co.

Plans for three annual conclaves were approved. As at present fall conclaves will be held in both northern and southern California. The general outline of the program suggested would include a brief joint session of all sections, parallel sessions of all sections which may or may not be divided into discussion groups and a final joint session of all sections. The final conclave of the year would take a form similar to past conventions of the association and will be held in the north and the south in alternate years.

Announcement was made at the meeting that plans have been completed for the conclave to be held at Fresno April 9 and 10. Programs are completed and all papers submitted in the prize contest have been judged. More papers were submitted in the contest this year than in 1935.

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Boulder Dam Officially Accepted by U. S.

Construction records were broken when Boulder Dam was officially turned over to the United States by the Six Companies, Inc., on March 1. All work was completed on the dam, powerhouse and other pertinent structures except installation of the powerhouse machinery some two years and two months ahead of the schedule laid out originally. Power generation is expected to start in July. Three of the 82,500-kva. turbine generators are now being installed together with circuit breakers, transformers, and other apparatus.

On March 1, Lake Mead, named in honor of the late Reclamation Commissioner, contained 3,800,000 acre-ft. of water, a little more than one-tenth of its ultimate capacity. The inflow was 7,000 sec.-ft. daily compared with a diversion of 5,600 sec.-ft. It is estimated that the 1936 flood flow will add at least 8,000,000 acre-ft. to storage in Lake Mead.

Contract for the construction of the dam and powerhouse was let March 11, 1931, and actual construction of the diversion tunnels began on Sept. 17 of that year. A total of approximately 4,400,000 cu. yds. of concrete was poured during the construction of the dam and powerhouse.

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MWD Calls for Bids For 141,000 Hp. in Motors

Bids for furnishing fifteen electric motors to drive the pumps of the Colorado River aqueduct project will be received at the Los Angeles headquarters of the Metropolitan Water District of southern California on April 16. It is believed that the purchase contemplated will be the largest pump motor order ever placed. The fifteen motors will have a combined capacity of 141,000 hp. Each motor installation will be approximately 12 ft. high and be from 9 ft. to 14 ft. in diameter. The specifications issued by F. E. Weymouth, general manager for the water district, reveal that the motor pumps will operate at 6,900 volts and 60 cycles. Six of the motors, for the Intake and Gene pumping plants of the aqueduct, will be 9,000 hp. each; the three for the Iron Mountain plant will be 4,300 hp. each, and the six for the Eagle Mountain and Hayfield lifts will be 12,500 hp. each.

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Rural Extension Rules Liberalized in Washington

More than 5,000 new rural customers will receive electricity this year under liberalized rural extension policies announced by major power companies and the Department of Public Service of Washington, according to Ferd Schaaf, director of the department. The new plan, which is the result of conferences between the department and power company officials, "will result in the construction of rural line extensions to the amount of $250,000, and will give Washington the most liberal and progressive rural line extension policies in the United States," Director Schaaf states.

Power companies have agreed to construct lines when the prospective annual revenue equals 25 percent of the cost of extension. Service will be provided customers on all rural extensions at standard rates. If the cost is more than four or five times the annual revenue, customers will construct and own part of the transmission lines.

Schaaf will go to Washington to ask the Rural Electrification Administration to liberalize its policies, so federal loans will be available to Washington farmers.

Mayor Backs L. A. Appliance Ordinance

As a result of the sincere and conscientious backing of Mayor Frank L. Shaw in providing personnel to make effective the provisions of the sub-standard electrical appliance ordinance in Los Angeles, the public of that community is assured of purchasing only appliances which meet definite standards as regards safety to life and property. Permanent manpower for enforcing the ordinance under the supervision of the Building and Safety Commission is now in the field.

Enforcement will only be directed toward such appliances and devices which are approved and listed by Underwriters' Laboratories. Pending examination and approval by U.L., provisional approval will be granted by the city commission provided application has been made to U.L. for listing. This provisional approval will only be extended provided definite proof is shown that such application has been made.

Letters have been written to all retail outlets advising them of the provisions of the ordinance and stating that inspectors are in the field to enforce it.

Leaders in the industry have expressed gratification over the cooperation of Mayor Shaw and have assured him of the electrical industry's desire to support his endeavors to protect the public from sub-standard appliances.

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• REMOVAL OF ELECTRIC light and power poles and overhead wires on south Los Robles Ave. and east California St., Pasadena, has been ordered by the Municipal Light and Power Department. The removal of the overhead system on south Los Robles Ave. is the latest step being taken to make Pasadena a poleless city, according to Benjamin F. DeLanty, general manager of the department. Pasadena has 73 mi. of electric conduits installed in 259 mi. of streets and the underground installation will be continued as rapidly as possible, Mr. DeLanty said.

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• SEVERAL SOUTHERN CALIFORNIA cities recently completed installation of sodium vapor intersection lights in the continuing effort toward greater highway safety. Recent installations have been made in Alhambra, San Marino, Monterey Park and San Gabriel. In San Marino twelve 1000-candle-power sodium vapor luminaires are in operation on Huntington Dr., a heavily traveled highway. The most recent installation was that of two 1000-candle-power units in Alhambra where Garfield Ave., Mission Rd. and Park Ave. intersect at a railroad crossing.

The Standard News

April 1936 — **Electrical Edition**

Published by THE STANDARD ELECTRIC STOVE CO., Toledo, Ohio

Background

Josiah Gilbert Holland, who died some fifty years ago, said—"There is no royal road to anything. One thing at a time, all things in succession. That which grows fast withers as rapidly; that which grows slowly endures." Just think it over.

The trees and plant life which spring up and mature rapidly wither rapidly and are soft cored. Those which require years to mature are hard of fibre and enduring. It takes many years to make a hardwood tree. Flowers of the annual type are pretty, no one questions that. But they perish permanently with the first rigors of fall.

To grow substantially, to build solidly, to endure and serve. This applies to life and business. It applies to products and designs. Quality remains long after price is forgotten. I think it was Simmons the hardware man who said that. What greater contribution can man or organization make than to develop and produce a product that serves its users satisfactorily throughout the years?

Experience and craftsmanship give character and lasting qualities to any product.

C. A. P.

Your Light Bill

We folks here in America have what we call a "Light Bill". Almost every one gets one every month. It originally was a "light bill". Nothing on it but electric lights. It used to be four or five or six dollars just for lights. We used to do everything possible to keep it down and if it went up fifty cents a month it made us howl bloody murder.

Don't you think it is about time we analyzed what is on our present "Light Bill" and christen it with a new name? I recently made a chart of what this bill represented for the years from 1895 to date in steps of five years and what we got for our money. (You may have a copy on request.) It is interesting to note what has crept into or onto this bill as the years progressed.

The up to the minute American home now pays for the following services on this bill and we still call it the light bill—Lights, refrigeration, cooking, water heating, cleaning, music, artificial sunlight, mixing, ironing, washing, massage, shaving and razor sharpening, time keeping, water bottle, milk warming, hair drying. Stop me, I could go on like this forever. And we still call it the "LIGHT BILL".

Isn't it about time we gave it a new name? How about "Service Bill" or "Household Bill"?

Standard's Complete Line

When you get Catalog No. 36, take the time to go all the way through it. You will find the largest and most complete domestic line on the market, covering every phase of electric cookery. You will find seven sizes for larger homes and estates. You will find six heavy duty ranges for hotels, restaurants, clubs, ships, etc. You will find ovens, griddles, water heaters in all sizes; one, two and three burner hotplates in various sizes; plate warmers, air heaters, steam tables.

There is no line quite like the Standard line. The distributor and dealer can fill any order from the Standard line.

A Popular Model

This is No. 1450 with the cabinet base. One of the most popular ranges ever built. It is also made with legs instead of cab base. The space under the switches may be either utensil cabinet or warmer. The oven is large and perfectly designed for

even heat and perfect baking. Smooth and clean. Fits the designed kitchen or will fit into and enhance the beauty of any kitchen. All Standards have heavy insulation, holding the heat in the oven, where it is needed to do the cooking. Consequently the table top is always cool. Just as cool as the kitchen. A real useful table top.

Do It Now

If you have been thinking it over but have not yet decided to get in touch with Standard, do it now. Just a card will bring the full data. The address is The Standard Electric Stove Company, Toledo, Ohio.

Each Forging Must Be

Uniform Throughout

Observe the form of the hot metal that has just been struck off in the above illustration. That form has been shaped by the use of the dies which are also visible. Two dies are necessary. One is locked in the base and one in the moving ram. (*above*)

These dies of hardened steel are the product of skilled craftsmen and are held to exact dimensions. After heating the forging billet to a plastic state and placing it over the lower die; the ram is dropped repeatedly and its impact forces the steel into the impression of the dies.

Once these dies are locked into position, each and every forging to follow must be uniform throughout while the hammering process serves to further refine the metal without any change of analysis. Uniformity of dimensions and physical characteristics are assured.

THE BREWER-TITCHENER CORPORATION

Cortland, New York

Through Your Insulator Manufacturer Only

FOR RELIABILITY,

INSIST ON A FORGING

Contracts Let for Boulder-Pioche Line

Contracts for the material and equipment for the construction of the $900,000 power line from Boulder dam to the mining districts near Pioche, Nev., have been let by the Lincoln County power district. Announcement of the awards was made by H. W. Crozier, engineer and manager of the project.

Copper conductor amounting to $235,000 was divided between the Anaconda Copper Mining Co. and the General Cable Co. General Cable type H H hollow conductor will be used on half of the line and Anaconda's hollow I-beam conductor will be used on the remainder.

The contract for poles and cross arms was awarded to Morrison-Merrill Co. of Salt Lake City. Insulators will be supplied jointly by the Westinghouse Electric & Mfg. Co. and the Ohio Brass Co. Ohio Brass will furnish the hardware.

Bids will be called at a later date for construction of substation estimated to cost approximately $300,000.

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Oregon Utilities Launch Intensive Range Campaigns

Selection of prospects, and then concentrated effort to close the sale of ranges and water heaters to each of these prospects, is the essence of the sales program of the California Oregon Power Co. and Mountain States Power Co., it was brought out in a series of sales meetings held in March to launch the year's first range activity. "We have made up our minds to work on these selected prospects until they have either bought, died, or moved away," said Glenn Jackson, vice-president in charge of sales for the combined companies. "Last year a few moved away, a few died, and a great many bought. We will continue to hammer away in this fashion."

Meetings were held in Kalispel, Mont. and Albany and Medford, Ore., to each of which were brought all salesmen and service men in the district.

Berkeley Snow, executive secretary, Northwest Electric Light & Power Association, spoke at each meeting, laying a background of electrical industry facts and trends which pointed to a bright future for sales in this business. William A. Cyr, Associate Editor, ELECTRICAL WEST, addressed the two Oregon meetings, stressing the need for dealer help in building load. Mr. Jackson had previously explained that an understanding between dealers and these utilities had resulted in dealers concentrating their efforts on the profitable lines of merchandise and leaving heavy appliances for the utilities.

REA Status Changed by Bill

With a substantial cut in appropriations for future rural electrification, the Norris Bill setting up the REA on a 10-year basis has passed the Senate. The bill places the present REA on the same basis as other independent agencies of the government for 10 years. Its objectives are to promote the expansion of power lines into unserved rural areas by making loans to states, territories, their political subdivisions, co-operative organizations, and non-profit or limited-dividend corporations. Privately-owned utilities are not eligible for loans.

Funds for the next two fiscal years will come from the Reconstruction Finance Corporation, which is directed to advance REA 85 per cent of the base value of borrowers' obligations turned over to RFC by the administrator, but not to exceed $50,000,000 per year. After 1938 RFC financing ceases and further funds will come from congressional appropriations with a maximum authorization of $40,000,000 per year.

In addition to loans for the construction or operation of plant transmission and distribution systems money also may be made available through sponsoring organizations to individual consumers or to electrical contractors for financing house wiring and plumbing.

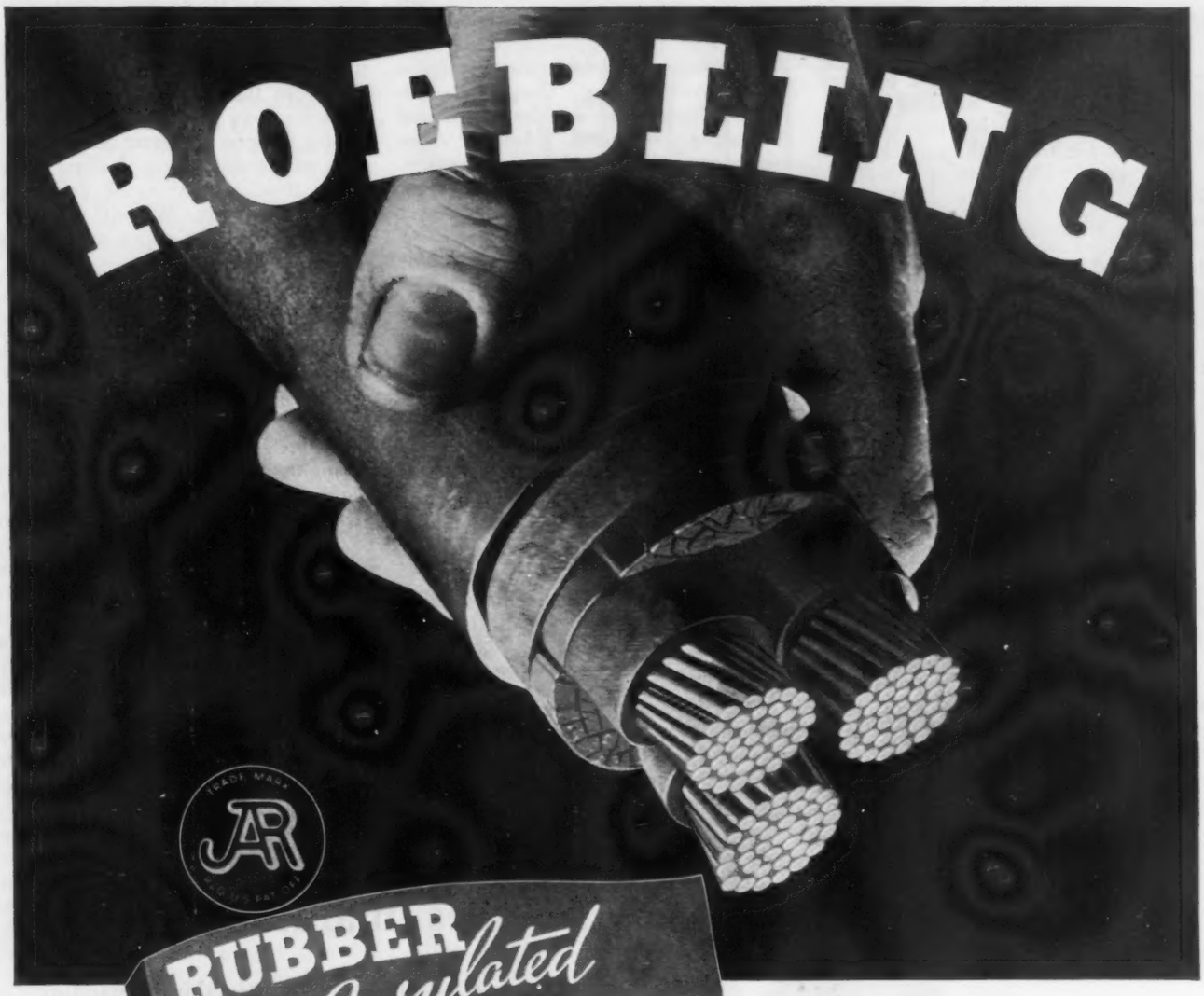
For **STRENGTH**

CROCKER FIRST NATIONAL BANK

OF SAN FRANCISCO

Member Federal Deposit Insurance Corporation

ROEBLING



RUBBER Insulated CABLES

For power transmission, railway signaling, building wiring, and many other purposes, Roebling Rubber Insulated Wire and Cable are available.

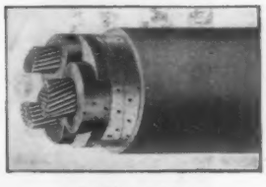
Plain Rubber 60% Sheath Power Cable. "SAFECOTE" Rubber-insulated and Braided Wires and Cables: Code, Intermediate, 30% and 40% Performance, 35% and 40% Performite. 40% and 60% Sheath Flexible Cords. Parkway, Service, Mining, Welding, and Control Cables; Tree Wire.

These will give you a fair idea of the completeness of the Roebling Line. They are made in a wide range of sizes and voltages. Armors:—steel, zinc, or bronze tape, or round steel wire.

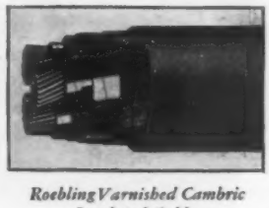
MANY OTHER TYPES

Power Cables: Paper; Cambric; Rubber » Station Cables » Slow Burning Wires and Cables » Weatherproof Wires and Cables » Submarine Cables » Portable Cords » Fixture Wire » Magnet Wire » And a wide variety of other wires and cables.

JOHN A. ROEBLING'S SONS CO. OF CALIF.
San Francisco - Los Angeles - Seattle - Portland



Roebling Paper Insulated Cable.



Roebling Varnished Cambric Insulated Cable.

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

Washington Water Power Outlines Dealer Program

"In the old days manufacturers used to spend their money showing pictures of the plant and the whiskers of the founders. Gradually they changed and showed the pictures of the product they were making. The next step was to show the product in use." With this statement R. B. McElroy, The Washington Water Power Co., announced the 1936 advertising program of that company and its dealers cooperative features. All advertising efforts will be concentrated upon selling the use of electricity. In fact the entire sales program stresses the slogan "Sell Use—and the People Will Buy Equipment."

A decided change from its previous program, is likewise inaugurated with the adoption of an "All Service" selling program on the part of the salesmen. Rather than specializing on one activity such as lighting, ranges, water heaters, etc., all salesmen now will sell the complete line to carry out the general purpose of selling use and service.

Cooperative features with dealers cover all appliance activities but place particular stress on water heating and general health and labor-saving devices. Plumbers this year will be urged to cooperate in the automatic water heater sales activity. To aid the dealer still further wherever possible his name will be used as offering the appliance, or the customer urged to see the appliance at his favorite store. Cooperative advertising promotion will be staged and campaigns conducted. Among these campaigns will be those on ranges, refrigerators, Better Light-Better Sight, home laundry equipment and table cookery. Likewise banks and financing firms are being contacted to acquaint them with the importance of the large volume of electrical merchandise business handled by the dealers and to secure their cooperation in financing dealer sales on a mutually satisfactory basis. An electrical sales bulletin carrying the reports of dealers sales in various districts totalled, is to be published and will also carry news and progress of the campaigns throughout the year. Dealers and wholesalers will be informed well in advance of merchandise promotion in order that they may avail themselves of the opportunity to participate in such events, according to C. J. Galloway, dealer coordination representative.

Every type of advertising will be used in the campaigns—newspapers, radio, poster boards, and direct mail.

Summarizing the activity, Mr. McElroy said, "In 1936 we will not be selling appliances nearly so much as we will be selling the economy, the ease, the comfort, the general happiness or the profit that results from the use of what we have to sell. We will try to appeal to some dominant buying motive such as freedom from drudgery, more spare time, better cared for hands, money saved, etc. We will try, too, to foresee and answer objections which the buyer may have.

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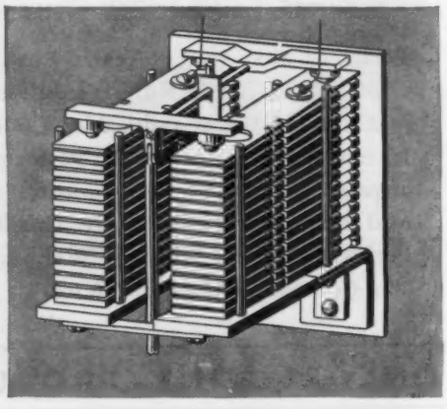
• Los Angeles Board of Water and Power Commissioners has approved a capital expenditure of $247,771, proposed by the Bureau of Power and Light, for general improvements, started during the month of March on the city's electrical system. The funds include $185,474 for the operating division, $37,096 for the general plant division and $25,200 for the design and construction division. A total of $151,500 will be used for miscellaneous additions, betterments and replacements to the overhead and underground low voltage systems. Other items in the authorization include constructions at the central receiving station on south Central Ave. and special automotive equipment for heavy-duty underground construction.

Smooth, accurate generator-voltage regulation that improves operation — reduces maintenance

Two new ratings now enable you to obtain this outstanding generator-voltage regulator for your smallest a-c machines. There are now five different sizes—all of the same design and characterized by automatically smooth regulation—with little or no maintenance. There are no vibrating contacts or dashpots. Why not get the improved operation, reduction in waste and better production that result from the use of these regulators? Ask your nearest G-E office or General Electric, Dept. 6D-201, Schenectady, New York

The heart of these new generator-voltage regulators is a simple, direct-acting, rheostatic element—the most significant advance in regulator design since the Tirrill regulator, developed in 1903. It provides an infinite number of smooth resistance steps from practically zero to maximum—*without the need for vibrating contacts or dashpots.* Ask for publication GEA-2022A.



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GENERAL ELECTRIC

Inspectors Announce Convention Plans

Announcement of plans for the Tenth Annual Convention of the Northwestern Section, International Association of Electrical Insectors, to be held in Olympia, Wash., Sept. 14-16, 1936, has been issued from the office of Fred D. Weber, Portland, secretary. Headquarters will be at the Hotel Olympian.

The association is inviting manufacturers' exhibits this year and warns interested persons that space reservations should be made early.

The technical program will bring forth suggested revision of articles of the National Electrical Code. Further the new arrangement of the code will be discussed. Beside the usual golf tournament and dinner dance, the local entertainment committee in charge of Chester M. Kirsop, city electrician, is preparing some unique features descriptive of the locality such as a clam and oyster bake. M. P. Hotelling, with the state electrical inspection division of the Department of Labor and Industries of Washington, is president of the Northwestern Section.

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Maintenance Engineers Perfect Organization

Perfecting a permanent organization electrical maintenance engineers of southern California have formed the Electrical Maintenance Engineers Association of Southern California and elected the following officers: W. E. Coburn, Los Angeles Board of Education, president; C. M. Hoag, Union Oil Co., vice-president; C. F. Kimball, Ford Motor Co., secretary-treasurer. The officers and the following members comprise the executive committee: R. C. Coon, Proctor & Gamble Co.; E. E. Lombard, Bethlehem Steel Corp.; D. H. Byl, Union Ice Company; A. F. Michael, Goodyear Tire & Rubber Co.; F. M. Murphy, Warner Bros. First Nat'l; L. N. Davis, Douglas Aircraft Co., Inc.

The association will meet once a month to present topics of interest to all maintenance men. A tentative list of program subjects includes electrical measurements in industry, power factor correction, industrial and office lighting systems and layout, safety in operation and maintenance of electrical equipment, operating control systems, photoelectric tubes and their application in industry, design and maintenance of drives.

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• IMPROVEMENTS in the light and power system of the British Columbia Electric Railway Co. in Vancouver, B. C. involving expenditure of over $1,000,000 are now under consideration. This was disclosed recently by W. G. Murrin, president of the company.

ARMORED CABLE
ARMORED SERVICE ENTRANCE CABLE
ANNUNCIATOR WIRE AND CABLE
APPARATUS CABLE
APPLIANCE CORDS
BARE COPPER WIRE AND CABLE
BUILDING WIRE—ALL TYPES
CONTROL CABLES, BRAIDED AND LEAD
FLAMEPROOF WIRE AND CABLE
FLEXIBLE CORDS AND CABLES
FLEXIBLE STEEL CONDUIT
FIXTURE WIRE
HEATER CORDS
HOOK-UP AND LEAD-IN WIRE
LAMP CORDS
LEAD COVERED WIRES AND CABLES
MAGNET WIRE
MINING MACHINE CABLE
NON-METALLIC PARKWAY CABLE
NON-METALLIC SHEATHED CABLE
PARKWAY CABLES
POWER CABLE
RADIO WIRE AND HARNESSES
RUBBER INSULATED WIRE AND CABLE
RUBBER SHEATHED PORTABLE CORDS
TELEPHONE CABLES
SERVICE ENTRANCE CABLES
SIGNAL CABLES
VARNISHED CAMBRIC CABLES
WEATHERPROOF WIRE

and all kinds of Special Cables to meet A.S.T.M., A.R.A., I.P.C.E.A., and all Railroad, Government, and Utility Companies' specifications.

The conductors in CRESCENT NON-METALLIC PARKWAY (TRENCH) CABLE are insulated with long-aging, special moisture-resisting rubber, permanently sealed against moisture and thoroughly protected against mechanical injury by tough, non-inductive armor tapes, and the sheath is filled and sealed with non-hardening asphalt.

The cable is not affected by ground acids, alkalis or water, and is lighter, easier to handle, and less expensive than metallic parkway cable.

47 YEARS
OF KNOWING HOW

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

Electrical Executives in Edison Foundation Drive

Memorials to Thomas A. Edison, including at least 50 scholarships open to American youth of exceptional ability, will be established by the Thomas Alva Edison Foundation, it was announced in New York, by Owen D. Young, national foundation campaign chairman.

Among the scores of leaders in the electrical industry who have joined the national committee of the foundation is Harry J. Bauer, president of the Southern California Edison Co. In addition to the scholarships, memorials will include the permanent one at Menlo Park, N. J., where Mr. Edison invented the electric light, and the library and laboratory in West Orange, N. J. The latter will become a perpetual shrine, housing originals and replicas of the inventor's creations.

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• A $90,000,000 ISSUE of Pacific Gas & Electric Co. first and refunding mortgage 3¾ per cent bonds, series "H," was over-subscribed within a few hours after the initial offering at 102¾. The issue will be used to retire bonds bearing higher interest rates and will effect a material saving in interest charges. It was the largest corporate offering since the passing of the SEC act.

Modern Operating Characteristics Obtained at Small Cost

This modern, high efficiency straight-flow nozzle, together with a runner of latest design, was practically all the hydraulic equipment needed for modernizing a thirty-year-old plant in California. From the standpoint of power output, operating cost, efficiency and safety, the modernized unit is far superior to the original installation, reconstruction costs having been comparatively insignificant.

Further details on this and other rehabilitated plants may be readily secured from Pelton engineers.

The Pelton Water Wheel Company

HYDRAULIC ENGINEERS

120 Broadway NEW YORK | 2919 Nineteenth St. SAN FRANCISCO | Paschall Station PHILADELPHIA

PELTON

Arizona Utility Expands Home Service Work

Ruth D. Kruger, who for the past six years has been home service director of the Bronx Gas & Electric Co. of New York City, has been appointed home service director of the Central Arizona Light & Power Co.

Miss Kruger has a wide and varied experience in the home economics field. For four and one-half years after her graduation from Coe College, Cedar Rapids, Iowa, she was in Honolulu, Hawaii, working first as dietitian of the Kamehameha schools and later acted as head of the women's department of Palama Settlement, doing nutritional and lecture-demonstration work.

Six years ago Miss Kruger left Hawaii to organize a home service department for the Bronx Gas & Electric Co.,

RUTH D. KRUGER

and continued as its director until she resigned to accept her present position. While in New York, she acted as secretary of the National Home Economics Association.

Four young women, who have been handling home lighting for the Company during the past two years, will act as assistants to Miss Kruger in the home service department. The wide activities planned for this department include active assistance to and cooperation with all local electric and gas appliance dealers in conducting sales campaigns and demonstrations.

•

•EARNINGS ON COMMON stock equivalent to $2.10 per share as compared with $1.52 per share in 1934, were announced in a preliminary statement of consolidated earnings for 1935 for the Pacific Gas & Electric Co. by President James B. Black. Electric revenues showed an increase of 1.4 per cent. This increase was despite rate concessions aggregating over $2,000,000 and smaller sales of power for agricultural pumping. At the close of 1935 the company was serving 1,341,939 active customers, both gas and electric, an increase of 40,533 during the year.

Serv'U'fone Expands Into Local Markets

Introducing Serv'U'fone, a telephone system for inter-room or inter-building service in homes, offices and factories, S. A. Martin, merchandise manager of the American Automatic Electric Sales Co., toured the Pacific Coast last month. Mr. Martin contacted wholesalers to promote the sale of phones through home-furnishing departments of large department and appliance stores.

Display of the systems in home furnishing departments is being introduced. Serv'U'fone is an automatic system accommodating from two to ten stations. Already being marketed by 447 distributors throughout the United States, the system is being introduced this year for the first time on the Pacific Coast.

Mr. Martin reports that the market has been very responsive to the idea of promoting private communication services for the home, office and factory and predicts that the West will develop a sustained demand for this type of equipment because of the growth that this section will enjoy in the future.

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565 Edison Employees Participate in Contest

Southern California Edison participants in the Pacific Coast Electrical Association problem contest for 1936 were awarded a certificate indicative of the appreciation of the company management for their interest in the problems of the industry. The certificate was signed by F. B. Lewis, vice-president and general manager.

A total of 565 Edison employees submitted papers in the 1936 contest. In 1935 431 papers were submitted. The Edison system was divided into three regions and the prize winner in each of the eight separate problem contests for each region will attend the annual conclave of the association to be held in Fresno, April 9 and 10.

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• CALIFORNIA's State Registrar of Contractors, William G. Bonelli, announced the release of a Digest of the laws of all the states of the Union licensing or taxing construction contractors. The Digest, prepared under the direction of Assistant Registrar Glen V. Slater, is expected to be of material value to the construction field and particularly to contractors whose operations extend into states other than California. Farthest advanced in the field of regulation, according to this report, are Arizona, California and Utah.

●

• UNPRECEDENTED LOW PAYMENTS on electrical appliance purchases have been inaugurated by the Puget Sound Power & Light Co., to stimulate the sale of new models. Included in the company's offer are a Hotpoint electric range at $1.75 down and per month, a square model Wesix electric water heater at $2.55 down and per month, and two other ranges, one Hotpoint and one Westinghouse, at $3.55 down and per month.

●

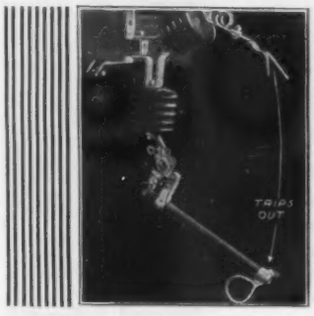
• THE BOARD of city directors of Pasadena has approved specifications for transformers to be used by the city in connection with its use of Boulder Dam power. City manager C. W. Koiner was authorized to call for bids on two 12,000-kva. transformers, to cost approximately $27,000 each, to be installed at the East Glenarm St. plant of the municipal Department of Light and Power.

●

• SOUTHERN UTAH POWER CO., Cedar City, Utah, following the recent trend in promotional offers has announced a free electricity program during April. Consumers may use as much electricity as they like during April but will pay no more than they did on their March bill. Announcement states that seasonal high water, which provides surplus energy, makes possible the offer to commercial lighting and domestic customers.

WHERE TO BUY . . . IN THE WEST

KEARNEY
TRIP OUT
FUSE SWITCH



Point pressure contacts — outage indicating — air gap separation of contacts — no cartridge burnouts — positive and accurate performance.

Write for Latest Bulletin

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

LOCUST PINS

Oak Brackets and Pole Steps

Safety • Strength • Lasting Economy

LOCUST PIN CO.
FRONT ROYAL, VA.

PROVIDENCE INSULATED WIRE CO.

Manufacturers of
Type AEIC Service Entrance Cable

PROVIDENCE

Samples and Prices on Request

■ Concentrically wound bare neutral conductor, galvanized flat armor, weatherproof and flame-proof finish.

For use on entrances without conduit.

Proof Against Theft of Current

PROVIDENCE INSULATED WIRE CO.
PROVIDENCE, R. I.

MAYDWELL & HARTZELL
INCORPORATED
FACTORY DISTRIBUTORS
LOS ANGELES SAN FRANCISCO

Portland Utilities Make Personnel Changes

To conform to new federal regulations respecting joint officers among inter-state electric utilities, several adjustments in personnel of the Northwestern Electric Co. and Pacific Power & Light Co., Portland, have been effected. C. W. Platt, formerly secretary and treasurer in both companies, has resigned those positions in the Pacific company and from the directorate of that company but continues as secretary and treasurer of the Northwestern Electric Co. and was elected to the board of that company.

M. J. Wilkinson, formerly assistant secretary and assistant treasurer of both companies has resigned from the Northwestern Electric Co. and has been elected treasurer of the Pacific company. C. M. Sanford has resigned his affiliation with Northwestern and has been elected secretary of the Pacific company. J. G. Hawkins has been made assistant treasurer of Pacific Power & Light and continues in charge of the accounting of that company.

S. E. Skelley, formerly assistant secretary of both companies, has resigned from Northwestern Electric and continues in that position for Pacific Power & Light Co. George L. Myers in addition to his position as assistant secretary of the Northwestern Electric Co. has been made assistant treasurer and will handle all business in connection with preferred stock and other securities of the company formerly taken care of by Mr. Skelley.

C. H. Gueffroy, formerly executive assistant in the office of Paul B. McKee, president of Pacific Power & Light Co., has been appointed assistant commercial manager of Portland Gas & Coke Co. He is succeeded as executive assistant by John Dierdorff who assumes this position in addition to his other work.

The right-of-way department formerly functioning for both companies has been separated and R. L. Stout will continue to function for the Pacific Power & Light while right-of-way matters for the Northwestern Electric Co. will be handled by E. F. Pearson, chief engineer.

•

New Appliance Stores In Southern California

Southern California seems resolved to allow no electrical appliance demand to perish unsatisfied for want of outlets. Reported are the openings of several new radio, refrigerator, and other electrical appliance stores.

At Banning, the Banning Electric Co. will sell appliances from a new store at 63 San Gorgonio Ave. B. B. Wood is the proprietor.

Indio will be served by a new electrical appliance and radio store of the Bear Valley Milling & Lumber Co., the store being managed by Jess Crowe.

In Long Beach, at 8023 Long Beach Blvd., Sam Bricker has opened the South Gate Refrigeration store, selling electric refrigerators.

Colton witnessed the opening of the Sunny Electric Shop, under proprietorship of J. B. Sunny, at 123 W. I St.

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• VOTERS OF NAPA, Calif., will pass upon the question "Do you favor municipal ownership of electric light and power for Napa?" at the municipal election on May 4. The question is merely to determine the sentiment of the electorate and was placed on the ballot following the presentation of a petition signed by municipal ownership advocates.

•

• A NEW MONTHLY MAGAZINE called "Puget Power News" has been started for employees of the Puget Sound Power & Light Co. The magazine is edited by J. Harvey Leach who has been with the company since 1912 and who recently was transferred from the position of manager at Renton to the general offices in Seattle as assistant advertising and sales promotion manager.

400 SIGHT-CRAFT "APOLLO" LUMINAIRES

...to furnish shadowless illumination

in San Francisco's FIRST privately owned office building built since the depression!

417 MONTGOMERY BLDG.
(LURIE BUILDING)

W. D. PEUGH, Architect
Alta Electric & Mech. Co.,
Electrical Contractors

These "APOLLO" Luminaires will make working a pleasure because SEEING will be EASIER . . . The owners will save in maintenance with these easy to clean, efficient luminaires . . . . The "VITROLUX" finish maintains its original EFFICIENCY and is not harmed by cleaning agents . . . Write for descriptive circular and prices.

SMOOT-HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA

SMOOT-HOLMAN COMPANY

Inglewood, California

San Francisco
154 Eighth Street

New York
10 Jones Street

Seattle
532 First Ave. So.

...about People

Pettingell Resigns as Oregon State Inspector

George Pettingell, chief electrical inspector for the state or Oregon, has resigned that position effective March 1 to become associated with the Fouch Electric Manufacturing Co., Portland, as engineer and salesman. As state inspector Mr. Pettingell was influential in organizing the inspection department in the Bureau of Labor under the new law passed at the 1935 legislature. His successor in this position has not been announced.

His new position spells expansion for the Fouch Electric Manufacturing Co., makers of panel boards, cabinets and switches. E. M. Fouch, principal owner of the company, states that his growing business demands the attention of a man of Mr. Pettingell's engineering and sales training, continuously out in the territory, which includes Oregon and southern Washington. Mr. Pettingell was for many years chief electrical engineer with Jaggar-Sroufe, a leading contracting firm in Portland.

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When N. J. Etienne of Chanslor & Lyon Co., San Francisco, distributors for Crosley radios and refrigerators, was back at a sales convention held at the factory, this picture of him was snapped. The Chanslor & Lyon organization made a record in the sale of Crosley refrigerators throughout California last year

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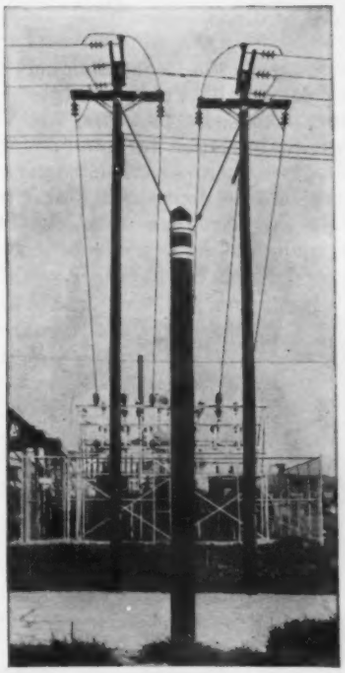
• KINSEY M. ROBINSON, president, Idaho Power Co., has announced several changes in the company organization beginning March 1. J. C. Baldridge, manager, Payette Division, has been brought in to Boise where he will assume special duties there. L. W. Brainard, sales manager of the company, has been put in charge of the division at Payette, at his request to gain operating experience. R. E. Gale, formerly division superintendent at Boise, has been made commercial manager in Mr. Brainard's place.

Crapo GALVANIZED PRODUCTS

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE, IND.



Specified for Most Important Jobs

Crapo Galvanized Steel Strand has earned its reputation for longer life and lower maintenance cost by outstanding performances in actual service over a period of years.

It constantly is being specified for the most important construction jobs because of its ability to more than meet every requirement for strength, ductility and resistance to corrosion.

Crapo Galvanized Steel Strand and Wire is available in all standard grades and sizes.

Indiana Steel & Wire Company
Muncie, Indiana

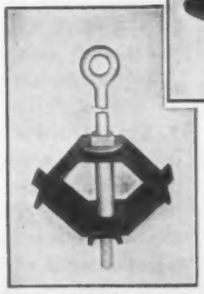
(Left) New lines erected by Department of Water and Power, City of Los Angeles, and guyed with *Crapo* Galvanized Steel Strand.

Steel Strand

• • •

Telephone and Telegraph Wire

RURAL LINE ANCHORS



New DEVELOPMENTS

Here are three new contributions to rural line building by the WORLD'S LARGEST ANCHOR MANUFACTURERS.

FOR RURAL ELECTRIFICATION

These anchors have been developed to meet the need for inexpensive anchors with sufficient holding power for light rural lines. They are powerful in pull, durable, light weight and well constructed.

Write for circular describing them in detail.

ORDER FROM GENERAL ELECTRIC SUPPLY CORPORATION

ABC INDUSTRIES

A·B·CHANCE CO· CENTRALIA MISSOURI

Cash In On the

PROFIT POSSIBILITIES

Of Selling

PRIVATE TELEPHONE SYSTEMS

Complete Systems From $12 Up

Now, at last, the alert electrical wholesaler, dealer or contractor can take advantage of the great profit-making possibilities which exist in the sale of Private Telephone Systems. One of the world's largest telephone manufacturers has perfected a sales plan whereby participation can be arranged on a very liberal basis.

These interior communication systems are well-known, widely-advertised types —the Strowger P-A-X (Private Automatic Exchange), the Autelco Intercom System and the Serv-U-Fone System. They range in capacity from 2 to 2000 telephones, and more. Prices, from $12 up.

If you are an electrical wholesaler, dealer or contractor, write us on your letterhead, asking for complete details of this new plan.

Autelco Private Telephone Systems are designed for private service. They cannot be connected with the public telephone system.

American Automatic Electric Sales Company

1033 West Van Buren Street, Chicago

Los Angeles
555 S. Flower St.

San Francisco
235 Montgomery St.

• HARRY J. BAUER, president of the Southern California Edison Co., Ltd., has been re-elected president of the Automobile Club of Southern California. This is his seventh consecutive year as president of the motoring organization. He also was re-elected to the board of directors.

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• IRA S. DAVISSON, commissioner of the Department of Public Utilities of Tacoma for the past 18 years, was re-elected to that position for another four years at a recent city election. As commissioner of this department, Mr. Davisson is the executive head of Tacoma's municipal light and power system.

•

C. L. McWhorter, Pacific district head of the Philco Radio and Television Co., after a phenomenal year of sales, is on his way to the Orient on a combined business and vacation trip

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• S. W. E. JOOST, formerly executive vice-president, has been made president of the Electrical Products Corp., with headquarters in Los Angeles. The firm has branch offices and factories in all of the Western territory. At the same time Harold E. Owen was elevated to vice-president and general sales manager and divides his time between the San Francisco and Los Angeles offices. M. R. Masshardt has been made regional sales manager in San Francisco.

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• LEONARD R. ELDER, of the Portland office of the General Electric Co., has been elected illustrious potentate of Temple, A.A.O.N.N.F. He is well known to the electrical industry of the Northwest, being active in both civic and industry activities.

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• JOE S. BOWMAN, Zork Hardware Co., was elected president, Harold Kongabel, of Westinghouse Electric & Manufacturing Co., vice-president, and J. A. Clifton, secretary-treasurer, of the Electrical League of El Paso at a recent annual meeting. Tribute was paid to the retiring officers, J. V. Laird, president, and L. J. Last, vice-president, at this meeting.

• TWO APPOINTMENTS on the Pacific Coast staff of the General Electric Co., were announced last month. C. W. Griffin was appointed district radio manager with headquarters at Los Angeles, Calif. Portland, Ore., is the headquarters of John Klenke, appointed district radio representative.

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• C. E. SAVIERS for many years engaged in the electrical appliance business at Reno, Nev., has acquired and is now operating the electric appliance and radio business of the Westinghouse store at 829-831 Fulton St., Fresno, Calif.

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• J. A. SMITH, well known to Pacific Coast inspectors through his activity as director of the Electrical Cord Manufacturers, has become affiliated with the Anaconda Wire & Cable Company as sales promotion manager as of March 1. His headquarters will be in New York.

•

• APPOINTMENT OF K. E. HOLLINGSWORTH, formerly of the central district sales manager's office of the Puget Sound Power and Light Co., to the position of local manager at Sumner was announced by the company last month.

PROFESSIONAL SERVICES

ELECTRICAL TESTING LABORATORIES

Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

80th St. and East End Ave., New York

ARTHUR R. KELLEY
CONSULTING ENGINEER

Reports and Valuations, Public Utility Industrial Properties

Edison Bldg. Los Angeles

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- RATES per column inch of displayed ads is $3.75.
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POSITION WANTED—Electrician, steadily employed, desires change in location, preferably Southwest. Has constructive record in generating and substation operating with some building maintenance experience. Married and small family. Age 45. Native born with a good background education. Out-of-town position acceptable if not too far from school. Address Box 55, Electrical West, 883 Mission Street, San Francisco, California.

LONG LIFE

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Air Cooled Transformers

The Air Cooled design of Jeffries Transformers assures long life together with reliable and efficient operation. Further—the high quality construction of all parts, from the carefully weighed and assembled magnetic circuit of low-loss, non-ageing steel to the completely insulated core and coil assembly, makes the maintenance cost of these transformers unusually low. Consult Jeffries on your requirements. Type S. S. Transformer, 500-1000 volt. amps. shown above.

JEFFRIES TRANSFORMER COMPANY
5706 Long Beach Ave., Los Angeles

This feature alone is putting numbers of these burners on electric ranges all over the country, encouraging electric cooking, building load for power companies. This popular top burner has many other exclusive and valuable features.

CHROMALOX

Super-Speed

ELECTRIC RANGE UNITS

Get the facts, from our representatives listed below—or write us.

EDWIN L. WIEGAND CO.
PITTSBURGH, PA.

Represented by

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
524 S. W. Pine St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. 3rd St., Los Angeles, Calif.

THE PETERSON COMPANY
1921 Blake St., Denver, Colo.

...about the Trade

• DOUBLING ITS FLOOR SPACE, the North Coast Electric Co., has leased the four-story building on the southwest corner of Second Ave. S. and Jackson St., Seattle, Washington. Moving from 206 Third Ave. S., the organization will have 32,000 sq. ft. of floor space in its new location. The move is part of an extensive expansion program, according to Harry Bryne, president. The firm handles wholesale electrical supplies, including refrigerators, washing machines, radios and oil burners.

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• VICTOR ELECTRIC PRODUCTS, INC., Cincinnati, Ohio, has announced the appointment of Bates Carpenter & Co., 606 Mission St., San Francisco, Calif., as northern California distributors for the products of this firm. The company manufactures ventilating equipment both in the domestic and commercial types.

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• WESTERN EXPANSION of the technical field service of the International Nickel Co., Inc., has resulted in the appointment of A. G. Zima as field representative at Los Angeles. Offering counsel on materials problems, Mr. Zima is located at 705 Petroleum Securities Bldg., Olympic and Flower Sts., Los Angeles.

•

• WESTINGHOUSE COMMERCIAL REFRIGERATION DIVISION has devised what it calls a Simplograph which makes easier the specification of correct equipment for commercial refrigeration. With it the salesman of such equipment can specify and prepare estimates in 2 or 3 min. and quote prices on the first call.

•

• NEWLY APPOINTED Stromberg Carlson distributor for northern California and in Salt Lake territory, is the Graybar Electric Co., San Francisco, Oakland, and Salt Lake City, according to Roy Kimberlin, in charge of appliance sales, San Francisco.

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• MOORE-BIRD CO., 1648 Arapahoe St., Denver, has been appointed distributor of Crosley refrigerators and radios for Colorado, part of Wyoming and the upper part of New Mexico. Harold Bird and J. C. Moore are proprietors of the firm.

•

V. C. MCKENNY, secretary-treasurer of NePage-McKenny Co., Seattle, has sold his interest in the firm to L. NePage and withdrawn from the firm. After an extended vacation, Mr. McKenny plans to re-enter the electrical and manufacturing business.

BRASS BUSHED
for greater strength

•

Hemingray Adds to its Long List of Advantages

1. Brass bushed smooth threads for insulator pin.
2. Greater mechanical strength.
3. Sustained high dielectric strength.
4. Unaffected by sudden temperature changes.
5. Withstand maximum insulator pin expansion.
6. Never age or deteriorate.
7. Controlled uniformity of product.
8. All surfaces impervious to moisture.
9. Tougher—withstand rough handling.
10. Clear and flawless for easy inspection.

Owens-Illinois Glass Company, Hemingray Division, Muncie, Ind.

HEMINGRAY
Glass
INSULATORS

YOU CAN MAKE QUICK PROFITS WITH FAST Selling CLIFTON

FRICTION TAPE
FRICTION CLOTH
AND SPLICING
COMPOUNDS

Represented by

GEO. E. HONN CO.
420 MARKET ST., SAN FRANCISCO

ASSOCIATED SALES ENGINEERS
912 EAST THIRD ST., LOS ANGELES

ALBERT S. KNIGHT CO.
3006 WESTERN AVE., SEATTLE

COMPLETE STOCKS CARRIED AT
ALL 3 PACIFIC COAST POINTS

CLIFTON MFG. CO.
65 BROOKSIDE AVE., BOSTON, MASS.

TRANSFORMERS
MADE IN THE WEST
TO SERVE THE WEST
QUICKLY

GARDNER serves the west quickly and efficiently from the only plant on the coast specializing in transformers for all purposes. Leading western utilities and industrials have proved that Gardner-built transformers give long, trouble-free operation.

GARDNER ELECTRIC MFG. CO.
4227 Hollis St., Emeryville, Calif.

REPRESENTATIVES
Geo. E. Honn Co.
420 Market St., San Francisco
Utility Supply Co.
1738 E. 15th St., Los Angeles

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Illustrated Catalog

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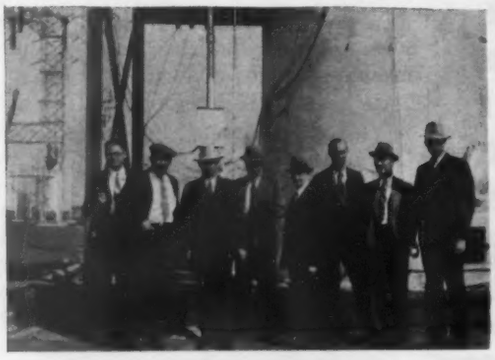
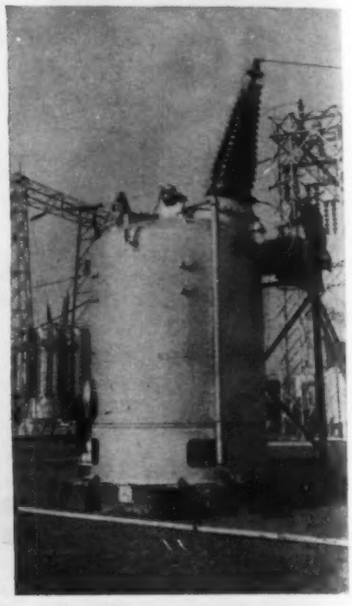
4227 Hollis St., Emeryville, Calif.
Please send me your new catalog, bulletin 500.
NAME .....
ADDRESS .....
CITY .....

Engineers Inspect Diablo Breakers

Seattle City Light engineers and representatives of Pacific Electric Manufacturing Co. standing beside one single pole unit of the three 3-phase 196/230 kv., 1,200-amp., circuit breakers recently purchased by the city for its Diablo Power project. The breakers have an interrupting capacity of 2,500,000 kva. From left to right are: H. L. Brooke and Ed Sixtus of Pacific Electric Mfg. Co.; J. W. Ferguson, L. H. Rose, and W. J. McKean, engineers of Seattle City Light; A. C. Schwager and Charlie Cutter of P. E. M. Co. and E. L. Gibney of Seattle





• B. & D. ELECTRIC CO. has taken over the electric contracting and merchandising business formerly conducted as Thackery Electric Co. in Red Bluff, Calif. The name takes its initials from H. L. Bohmfalk, who is in charge of the wiring and contracting end of the business, and J. R. Davis, who handles the store and merchandising. Since the first of the year the company has become the Westinghouse appliance store in Red Bluff.

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•BOWER & BUTTON, INC., maintaining a policy of expansion, has added an entire store to their present one at 716 South Pacific Ave., San Pedro, Calif. Partitions were removed and the two stores combined and completely stocked with electrical appliances. Since opening six years ago this is the company's third expansion. E. J. Bower is president of the firm.

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• ENLARGEMENT of its electrical department has been announced by Hennessy's, of Butte, Mont. D. W. True, general manager of the store, also announces that L. S. Talbert, buyer from Hennessy's New York office, and himself had appointed O. C. Crutchfield, formerly associated with Maytag washers as manager of the Montana and Wyoming districts, to head the new electrical appliance department.

•

• SUTTON & LINSEA GAS & ELECTRIC Co. is a newly established appliance store at 2819 Whittier Blvd., Los Angeles. Both members of the firm have been associated with appliance merchandising for several years.

• CLARE SMALLCOMB, motor dealer and specialist in electric ventilation, has been appointed a distributor for the Ilg Electric Ventilating Co., of Chicago, for the southern California territory.

...in New Equipment

Westinghouse Introduces Signaling Roaster

A signaling rectangular roaster, on which a light indicates the desired cooking temperature, and in which a 15-pound ham or fowl can be cooked, has been announced by Westinghouse Electric & Mfg. Co. The roaster is finished in black, baked-on enamel, chrome plate trim, with chrome cover and wood handles. It is furnished with a large rectangular vitreous enamel inset and three rectangular, heat resisting Glasbake dishes, two with Glasbake covers. Rated at 115 volts, 1,200 watts, it has a temperature range of 150 to 550 deg. F.

●

"Speedster" Range

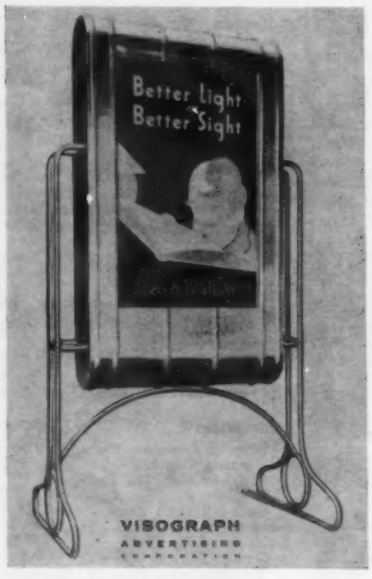
Priced to sell to the market, a new electric range known as the G.E. Speedster has been introduced by the specialty appliance sales division of the General Electric Co., Cleveland, Ohio. One feature is a new "Tripl-Oven", which has the advantage of high speed, greater economy, and greater capacity. Other features include the sliding oven shelves with safety stop at rear; hi-speed Calrod surface unit; new smooth top 6-qt. Thrift Cooker; automatic temperature control with pilot light; new type storage compartment; modern table top styling; white, all-porcelain finish with black and chrome trim.

●

Display Device For Dealer Aid

An automatic poster device, showing in succession twenty standard one-sheet black and white or colored posters or enlarged photographs, has been announced by the Visograph Advertising Corp., 342 Madison Ave., New York City. The Visograph was created as an aid to dealers at the point of purchase.

The Visograph is placed on the display floor or in display windows. Light reflected from crimped chromium plates installed in back of the poster evenly illuminates the picture, which is automatically changed at ten-second intervals. It is designed to emphasize action, color, light and third dimensional effect. Illumination is attained through the use of four Lumiline lamps, totalling 200 watts.



New Motor Starter By Allis-Chalmers

Allis-Chalmers Mfg. Co. has announced a fusible combination across-the-line motor starter, developed at its Condit Electric Mfg. Division, Boston, Mass. Features are vertical make-and-break short stroke mechanism, arc prevention principle and self-aligning umbrella-shaped contacts of high thermal absorption. It is rated 25 hp. at 440 and 550 volts, 15 hp. at 220 volts, and 7½ hp. at 110 volts.

●

Clamp Connector Has Versatility

Wide ranges of cable sizes can be accommodated without injury to strands by use of a new clamp-type connector, announced by the Burnby Engineering Co. Inc. of New York. Known as the V-line, the new connectors use a durium U-bolt, forged broad at the clamping area. Durium is a copper alloy, claimed to develop a tensile strength greater than steel and to be immune to corrosion or season crack.

Light Salesmen Now Can Hit the Spot

A kit for the light salesman, which enables him to demonstrate new lighting, right where it should be demonstrated, such as at the ceiling of a room, has been developed by the Wakefield Brass Co. of Vermillion, Ohio. The entire outfit weighs only 14 lb.

Feature of the kit is a light-weight pole, jointed like a fishpole. This the salesman can unlimber, hook around the fixture, and raise to any height desired. Included in the kit is a light-weight lighting fixture, called the Wakefield "Commodore." It is constructed with an aluminum shank and canopy and Plaskon translucent shade.

●

Mercury Vapor Transformers

A new line of transformers and reactors for operating the new type mercury vapor lamp has been announced by Jefferson Electric Co., Bellwood, Ill. Four distinct styles are available. The inclosed types include indoor wall mounted styles, indoor suspension or fixture type and weatherproof type. In addition the same unit may be obtained in core and coil types without inclosures. A special feature is the snap-on, self-locking plug and jack connections which provide quick change of primary tap to match the voltage of the power supply line.

Three New Royal Cleaners

P. A. Geier Co., Cleveland, Ohio, announces the addition of three new vacuum cleaners to round out a complete line of models. The new cleaners have an entirely different appearance, embodying a distinct stream-line design which adds considerably to their sales appeal. Two of the new models will have the popular head light feature. Six other floor type cleaners constitute the Royal line at a wide price range.

●

New Alloy Used In Low-Voltage Contactor

A low-voltage alternating current contactor, which stays closed through voltage disturbances, eliminates latching-device wear and is free from transformer hum, has been developed by the General Electric Co. Mechanical latching mechanism is replaced by a direct current magnet, which closes the contactor, and a permanently magnetized core and movable armature hold the contactor closed.

A copper-oxide rectifier energizes the direct current magnet. The permanent magnet is made of Alnico, a new alloy which retains its magnetism indefinitely and increases the force exerted per unit weight approximately 40 per cent over previous permanent magnets. To open the contactor the coil exciting current is reversed, thus momentarily "bucking down" the permanent magnet flux.

●

Conduit Built to Resist Corrosion

Suparduct is the name of a new conduit announced by the National Electric Products Corp. at Pittsburgh. Claimed for Suparduct is resistance to both usual and unusual forms of corrosion without sacrifice of the attributes of steel conduit. Suparduct will be furnished in threaded, standard 10-foot lengths with a coupling at one end. It is listed and approved by the Underwriters' Laboratories, Inc.

●

Coffee Maker Stove

Silex Co., Hartford, Conn., has placed on the market a new warming stove rated at 50-watts. The size of a small plate, the stove is made of highly polished chrome and stands on 4 composition, heat resistant, ½-in. legs. It can be used for a variety of purposes such as keeping the coffee warm in a glass coffee maker, warming plates or keeping food warm.

...in Trade Literature

SALES PROGRAM OUTLINED—The Hotpoint Co. of Chicago has set forth a complete sales program for April, May and June in its spring plan book, developed under the direction of W. A. Grove, advertising and sales promotion manager. Presented is a load-building and merchandising program for utilities and dealers. Coordinated with Hotpoint's spring "early bird" campaign, and supported by national advertising, the program suggests the use of "redbird" and "bluebird" buttons for employees competing in spring sales contests.

●

INDIRECT LIGHTING in a variety of applications is illustrated in Handbook H, No. 808, published by Curtis Lighting, Inc.

●

UNIT SUBSTATIONS, published by the General Electric Co., Schenectady, N. Y. Economic advantages of small, standardized substations, factory-built, are set forth in this bulletin. Several units, both outdoor and indoor, are illustrated. A discussion of primary network operating problems is included.

●

THE LAPP INSULATOR CO., INC., LeRoy, N. Y., announced the publication of Bulletin No. 123, describing and cataloging Lapp line post and station post insulators. Drawings, photographs, technical data, discussion of tests and installations are submitted.

●

FLEXSTEEL FLEXIBLE THIN WALL CONDUIT is discussed in a new, illustrated catalog published by the National Electric Products Corp., Fulton Building, Pittsburgh, Pa.

●

WIRE AND LOADING TABLES—These tables for Copperweld-Copper conductors are contained in the new Copperweld data sheet, E. D. 1626, available at the Copperweld Steel Co., Glassport, Pa.

●

POWER TRANSFORMERS, published by Westinghouse Electric & Mfg. Co., 32 pages, illustrated. Described are performance characteristics, insulation coordination, core and coil construction, cooling, painting, condenser bushing features, auxiliary devices, and testing facilities. Copies are available through district offices or the advertising department, East Pittsburgh, Pa.

●

MERCURY VAPOR-MAZDA fixture equipment is covered in catalog No. 870, published by the Miller Co., Meriden, Conn. Included are charts of foot-candle intensities plotted against distance for different fixtures in various positions.

●

WOLVERINE TUBE CO., Detroit, has published a bulletin on Wolverine cable terminals and connector sleeves. The bulletin lists the specifications, sizes, and styles of standard and special soldering lugs, sleeves and connectors.

●

GARDNER ELECTRIC MFG. CO. announces its new Bulletin No. 500 is now ready for distribution. This bulletin covers the standard line of Gardner distribution and power transformers and includes complete data on standard transformer characteristics, dimensions and other details.

●

AN ALLIS-CHALMERS MFG. CO. bulletin, describing and specifying the new vari-pitch Texrope sheave, has just been published.

WHERE TO BUY IT IN THE WEST

Roller-Smith Company

3 Barclay St., New York City — Works: Bethlehem, Pa.

★ INSTRUMENTS (Indicating and Graphic) ★ CIRCUIT BREAKERS (Air and Oil)

★ INSTRUMENT AND CONTROL SWITCHES

★ SWITCHGEAR ★ RELAYS

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Frigidaire Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Kelvinator Corp.

Ammeters and Voltmeters
Bristol Co.
General Elec. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instr. Corp.

Anchors, Guy
A. B. Chance Co.
James R. Kearney Corp.

Anchor and Guy Rods
A. B. Chance Co.
General Elec. Co.
Hubbard & Co.

Appliances, Household
Edison Gen. Elec. Appliance Co., Inc.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
McGraw Elec. Co.
National Enameling & Stamping Co.
Waters-Genter Div.
Westinghouse Elec. Supply Co.

Boxes
General Cable Corp.
General Elec. Co.

Bus Fittings
Burndy Eng'g Co.
General Elec. Co.

Brackets, Wood
Locust Pin Co.

Breakers

Air Circuit Breakers
General Elec. Co.
I-T-E Circuit Breaker Co.
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.

Oil Circuit Breakers
Allis-Chalmers Mfg. Co.
General Elec. Co.
Pacific Elec. Mgf. Corp.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.

Buses
Aluminum Co. of America

Cable Accessories
General Cable Corp.
General Elec. Co.
John A. Roebling's Sons Co.

Cables
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Crucible Steel Co. of America
General Cable Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Maydwell & Hartzell, Inc.
National Elec. Products Corp.
Providence Insulated Wire Co.
John A. Roebling's Sons Co.
United States Steel Corp.
Westinghouse Elec. & Mfg. Co.

Carbon Brushes
National Carbon Co., Inc.

Carbon Products
National Carbon Co., Inc.

Chimes
Square D Co., Inc.

Coil Winding
Jeffries Transformer Co.

TRY THE SUPER-POWERED JUMBO FIRST

IDEAL "JUMBO" cleaner Blows, Vacuums, Sprays. Powerful! Let us prove its superiority. 10 day free trial.

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Ideal Commutator Dresser Co.

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General Elec. Co.

Condensers, Electric
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Conduit
Aluminum Co. of America
General Elec. Co.
Youngstown Sheet & Tube Co.

Conduit, Underground
Fire Proof Wall Co.
Johns-Manville Corp.

Connectors
Burndy Eng'g Co.
James R. Kearney Corp.

Controllers
Allis-Chalmers Mfg. Co.
Clark Controller Co.
General Elec. Co.
Square D Co.
Westinghouse Elec. & Mfg. Co.

Cutouts
James R. Kearney Corp.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Demand Control
General Elec. Co.
Wesix, Inc.

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General Elec. Co.
James R. Kearney Corp.
Maydwell & Hartzell, Inc.
St. Louis Malleable Casting Co.

Electrodes, Arc Welding
John A. Roebling's Sons Co.
General Elec. Co.

Fans
General Elec. Co.

Farm Electrification Equipment
General Elec. Co.

Fittings, Conduit
General Elec. Co.

Fittings, Insulator
Brewer-Titchener Corp.

Fixtures, Lighting
General Elec. Co.
Smoot-Holman Co.

Floodlighting
General Elec. Co.
S & M Lamp Co., Inc.
Smoot-Holman Co.

Gasoline
Union Oil Co.

Generators
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Graphite Products
National Carbon Co., Inc.

Ground Rods
Crucible Steel Co.
Maydwell & Hartzell, Inc.

Heaters, Air
Edison Gen. Elec. Appliance Co.
Noblitt-Sparks Industries, Inc.
Thermador Elec'l Mfg. Co.
Wesix Inc.
Edw. L. Wiegand Co.

Heaters, Water
Edison Gen. Elec. Appliance Co.
Fowler Mfg. Co.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Sandoval Sales Co.
Standard Elec. Stove Co.
Thermador Elec'l Mfg. Co.
Wesix Inc.
Westinghouse Elec. & Mfg. Co.

Heating Element—Repair Part
Edw. L. Wiegand Co.

Instruments, Measuring and Recording
See Ammeters, Voltmeters, Wattmeters.

Insulation
General Elec. Co.
Johns-Manville Corp.

Insulators
Brewer-Titchener Corp.
Corning Glass Works
Graybar Elec. Co., Inc.
Hemingray Glass Co.
Geo. E. Honn Co.
Lapp Insulator Co., Inc.
McLaughlin Glass Co.
Owens-Illinois Glass Co.
Westinghouse Elec. & Mfg. Co.

Where to Buy It in the West—*Continued*

Irons
General Elec. Co.
Savage Distributing Co.

Knobs, Tubes, Cleats
Standard Elec'l Porcelain Mfrs.

Lamps, Mazda
General Elec. Co.
Westinghouse Lamp Co.

Lamps, Student
Lumidor Mfg. Co., Inc.

Lamps, Sun
General Elec. Co.

Lighting Equipment
Smoot-Holman Co.
Wuelker Flexo-Dome Co.

Line Material
Maydwell & Hartzell, Inc.

Meters
The Bristol Co.
General Elec. Co.
L. A. Nott
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec'l Instrument Corp.

Motors
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Motor Starters
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Oil, Lubricating
Associated Oil Co.
Union Oil Co.

Oil, Transformer & Switch
Associated Oil Co.
General Elec. Co.
Union Oil Co.

Panel Boards
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Photoelectric Cells
General Elec. Co.
Weston Elec'l Instrument Corp.

Pins, Wood
Locust Pin Co.

Pole Line Hardware
Brewer-Titchener Corp.
General Electric Supply Corp.
Graybar Electric Co., Inc.
Hubbard & Company
Joslyn Co. of California
Kortick Mfg. Co.
Maydwell & Hartzell, Inc.
Western Hardware & Tool Co.

Porcelain
Standard Elec. Porcelain Mfrs.

Public Utilities
California Oregon Power Co.
Idaho Power Co.
Mountain States Power Co.
Northwestern Electric Co.
Pacific Gas and Electric Co.
Pacific Power & Light Co.
Portland General Electric Co.
Puget Sound Power & Light Co.
San Diego Cons. Gas & Elec. Co.
San Joaquin Light & Power Corp.
Southern California Edison Co. Ltd.
Utah Power & Light Co.
Washington Water Power Co.

Pullers, Slack
A. B. Chance Co.

Pumps
Pelton Water Wheel Co.

Range Units
Edison Gen. Elec. Appliance Co.
Edwin L. Wiegand Co.

Ranges
Edison Gen. Elec. Appliance Co.
General Elec. Co.
General Elec. Supply Corp.
Kelvinator Corp.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Standard Elec. Stove Co.
Steiger & Kerr Stove & Fdry. Co.
Walker & Pratt Mfg. Co.

Refrigerators
Frigidaire Corp.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Kelvinator Corp.
Malleable Iron Range Co.
Westinghouse Elec. & Mfg. Co.

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General Elec. Co.
Hart Mfg. Co.
Roller-Smith Co.

Rheostats & Resistors
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

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Pacific Coast Elec'l Ass'n
Pacific Coast Elec'l Bureau

Strand, Guy
Crucible Steel Co.
Maydwell & Hartzell, Inc.
Pacific Wire Rope Co.

Switchboards
Allis-Chalmers Mfg. Co.
General Elec. Co.
Roller-Smith Co.
Square D. Co., Inc.

Switches, Heater
Bryant Elec. Co.
General Elec. Co.
Hart Mfg. Co.

Switches, High Tension
James R. Kearney Corp.

Switches, Meter Test
General Elec. Co.
Meter Devices Co.

Switches—Pressure and Temperature
The Bristol Co.
Hart Mfg. Co.

Switches, Safety
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Square D Co., Inc.
Westinghouse Elec. & Mfg. Co.

Switches, Thermostat Controlled
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Hart Mfg. Co.
Thermodor Elec'l Mfg. Co.

Switches, Time
General Elec. Co.
Sangamo Elec. Co.

Switchgear
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

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